Working Together for Prevention and Control of Zoonoses in India

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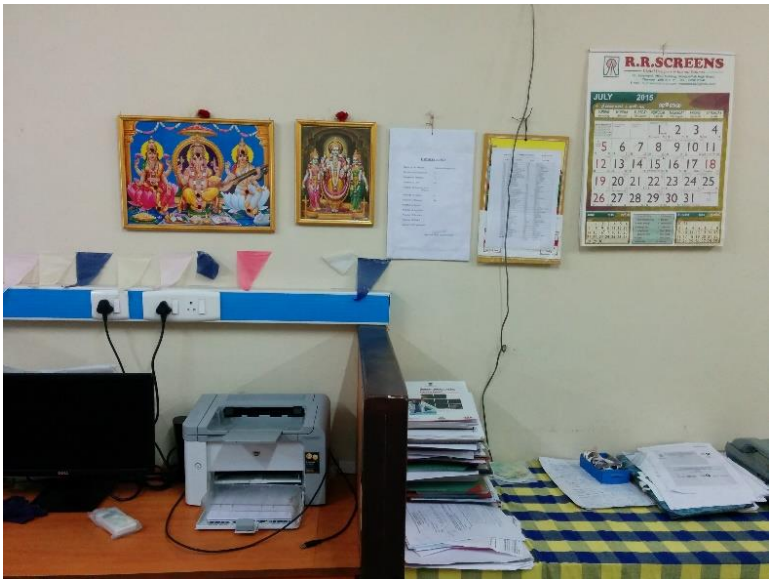
Doctor of Philosophy



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Declaration

I hereby declare that this thesis, whether in the same or different form, has not been previously submitted to this or any other University for a degree.

For Ammar & Zahra

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Summary

Despite calls for collaborations across animal and human health sectors to control zoonoses, a 'black-box' approach to collaborations means there is limited understanding of their drivers, characteristics and dynamics. In this thesis, I develop insights into multisector 'One Health' collaborations by examining the case of three zoonotic diseases in two states in India. Over nine months of fieldwork, I interviewed policy actors spread across different sectors, functions and administrative levels, and observed the practices of professionals in the field and in their offices. I used the examples of anthrax, brucellosis and leptospirosis to examine One Health collaborations in the states of Tamil Nadu and Gujarat in India.

The identification, measurement and response to zoonoses are complex undertakings requiring specialist expertise. Consequently, discourses and practices around zoonotic diseases are dominated by technical experts. The process of synthesizing and reinterpreting scientific knowledge, in turn, is influenced by politics and power dynamics underlying the experts' disciplines, sectors and institutions.

Across all three zoonoses, I found that it is narratives about diseases, rather than actual disease burdens or risks, which drive public perception and policy response. The way collaborations ultimately emerge is conditioned by the disease characteristics and is influenced by an interplay of the disease discourses, the political cultures of the state and the practices employed by decision-makers at all levels.

In all cases, collaborations do occur, sometimes facilitated by formal guidelines, but very often through everyday practices, in spite of bureaucratic strictures. All cases of collaboration are underpinned by informal networks. Such initiatives, frequently led by middle-level bureaucrats, while responsive to local concerns, are much messier than the processes envisioned in the dominant programmatic literature on 'One Health'.

In order for One Health partnerships to be sustainable, I argue that it is important to develop a nuanced approach to understanding the politics and dynamics underlying multisector collaborations.

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1 INTRODUCTION

Zoonotic diseases are those that are transmitted between animals and humans (WHO, 2010). Zoonoses have gained increasing visibility internationally, especially following the landmark reviews that identified and quantified the 'threat' posed by animal origin diseases to human populations. Sixty percent of all human diseases come from animals, both wild and domestic (Woolhouse and Gaunt, 2007). These zoonoses present some of the major challenges for global public health. Avian influenza, SARS, MERS, Zika and Ebola are all zoonoses. Major human illnesses such as malaria and HIV emerged first from animal populations, and subsequently spread dramatically among humans (Wolfe et al., 2007). Beyond the headline 'outbreak' focused zoonoses, there are many others; more neglected by science and policy, but nevertheless devastating to often poor and marginalised communities across the world. Examples include bovine tuberculosis, brucellosis, and sleeping sickness. The total burden from zoonoses related diseases is huge – the economic losses from six major outbreaks of highly fatal zoonoses from 1997 to 2009 was estimated to be more than $80 billion (The World Bank, 2012, p. 39). The potential cost of a single major outbreak of influenza could run into $6 trillion (The World Bank and EcoHealth Alliance, 2018, p. 34). Even those zoonotic diseases that are relatively less discussed are estimated as causing 2.7 million deaths annually (Grace et al., 2012b, p. 6). Zoonoses are therefore a major development issue.

In order to address zoonoses outbreak prevention and control, many approaches have been proposed. Huge sums have been invested in vaccines and drug programmes, in 'virus hunting' and genomic profiling and in early warning and response programmes[1]. Regardless of the specific approach, everyone seems to agree that early response focused on the origins of zoonotic emergence is essential for preventing its spread (Garrett, 2018).

However a missing element in this discussion is often how to encourage collaboration between professionals operating in different sectors – notably between those dealing with wild and domestic animals (such as veterinarians, wildlife ecologists and agriculturalists) and those dealing with human public health (clinicians, microbiologists, epidemiologists and public health officials). In bureaucratic systems such professionals often work in different departments, with different incentives, and with different disciplinary

[1] For example, the ongoing $100 million USAID 'Predict' project and the even more ambitiously proposed Global Virome Project, costing $1.2 billion (Carroll et al., 2018)

backgrounds and professional priorities. Yet their interaction and collaboration is essential in addressing zoonoses.

In recent years, particularly following the avian influenza outbreaks of the mid-2000s, the concept of One Health has been promoted (which itself builds upon discussions around One Medicine, Ecohealth and Conservation Medicine) (Waltner-Toews, 2009; Zinsstag et al., 2012, 2011). This makes the case for a holistic, integrated approach linking human, animal and ecosystem health (Bardosh, 2016; Cunningham et al., 2017) (also see chapters 2 and 4). But how this should happen in practice, and why it often doesn't, is not explored. This thesis aims to fill this gap by exploring the politics and practice of intersectoral collaboration, comparing the experience across three zoonotic diseases (anthrax, leptospirosis and brucellosis) and across two states in India (Gujarat and Tamil Nadu).

Through this chapter, I will introduce my research, offering a general background and my motivations for choosing my research question. Lastly, I will describe how the thesis is organised, so as to answer my research question.

1.1 A FOCUS ON ZOONOSES AND COLLABORATION

There are important biological and ecological reasons why zoonoses are a significant health threat. As explained by Daszak et al (2000) viruses and bacteria normally circulate within wild populations without causing human disease. However, when conditions change, these can then emerge as disease causing pathogens:

> *"Emerging infectious diseases (EIDs) of free-living wild animals… have two major biological implications: first, many wildlife species are reservoirs of pathogens that threaten domestic animal and human health; second, wildlife EIDs pose a substantial threat to the conservation of global biodiversity. (Daszak et al., 2000, p. 443)*

While it is important to recognise that microorganisms circulate naturally within different species, disease emergence can be linked to specific ~*ecological, environmental, or demographic factors that place people at increased contact with a previously unfamiliar microbe or… promote dissemination*" (Morse, 1995, p. 7). Factors alluded to in the preceding quote include climate change, change in land use, agricultural intensification, increased contact with and trade in wildlife, as well as globalization and air travel (Daszak et al., 2013; Hahn, 2010; Jones et al., 2013; Karesh et al., 2005; Kilpatrick, 2011; Patz et al., 2004).

Addressing such a broad array of factors and preventing diseases from 'spilling over' across different species required more intellectual and capital resources than could be

afforded within the physician dominated public health sector. At a stage where the global health community was becoming more aware of the importance of emerging and other infectious diseases, the early 2000s were marked by SARS and avian influenza outbreaks that highlighted the role played by animal populations as potential sources for new infections (King, 2004; Scoones and Forster, 2008).

As Cassidy (2018) points out in her insightful account of the origins of the One Health movement, the increased awareness about the health threats posed by wildlife was capitalised upon by a group of researchers and policy makers who were already working on transboundary diseases to make the case for a collaborative approach to health. The resultant One Health vision reformulated the 'One Medicine' approach popularised by the veterinarian Calvin Schwabe (1998) to go beyond veterinary and clinical collaborations and aim to prevent diseases from emerging from wildlife and affecting humans (Karesh and Cook, 2005).

Collaborations between the animal and human health sector in itself is not a new phenomenon, and in fact, both the disciplines have a shared history of conducting academic, research and disease control activities together before institutionalisation had set in (Woods and Bresalier, 2014). However, given the fact that animal and human health sectors are now governed by different bureaucracies and have different operational incentives, establishing a working animal-human health partnership seems like a big ask at all levels of operation. Policy discussions around zoonoses famously include references to 'silos' and 'falling through the cracks'(Jerolmack, 2013; Schmidt, 2009).

Interestingly, some of the earliest acknowledgement of the need for breaking these disciplinary and bureaucratic silos came from agencies like WHO & FAO – institutions that are themselves large bureaucracies (Weiss, 2016). This intervention took the form of institutional reforms, starting with the development of a veterinary public health unit within WHO in 1958 which later urged member-states to replicate the same structure at country level (FAO and WHO, 1975; Woods and Bresalier, 2014).

The floating of the One Health agenda in early 2000s allowed officers within these institutions to again make a case for intersectoral collaboration using the arguments of practicality and efficiency, as voiced in the following WHO document:

> *"The key to detecting and controlling the emergence or re-emergence of zoonoses is coordinated action on the part of animal and human health sectors. In particular, it is crucial to detect and control early any emerging and re-emerging zoonoses at the animal source to prevent it from infecting human population… Thus it is critical to establish good collaborations between animal and human health sector to ensure synergistic actions, make*

> *rational use of available resources, improve efficiency." (WHO South East Asian Regional Office et al., 2008, p. 6)*

The CDC Stone Mountain Meeting subgroup on self-assessment has come the closest to discussing the operationalization of One Health at the national and sub-national levels. It proposes an inclusive definition of One Health; "*an interdisciplinary approach to minimizing harms and maximizing benefits from the co-management of human, animal and environmental health*". It highlights the importance of having a shared vision of expected goals and outcomes as one of the necessary elements of One Health, but stops short of proposing a framework for operationalization of One Health. (CDC Stone Mountain Meeting Group, 2013)

This instrumentalised use of One Health, even as its meanings were contested, did not go unnoticed – leading Woods *et al.* to refer to it as a 'scientific bandwagon' (2018, p. 215). The One Health movement faced multiple critiques throughout its history. The criticisms included comments on the challenges of governing One Health, the skewed nature of the political economy of One Health, as well as its disconnect with local contexts and practices (Bardosh et al., 2017; Galaz et al., 2015; Hinchliffe, 2015; Lee and Brumme, 2012). Social scientists have argued about the need for studying practices within local contexts in conceptualising One Health (Craddock and Hinchliffe, 2015; Dzingirai et al., 2017a). Therefore, in this research, I aimed to examine the understandings and practices of animal-human collaborations within the context of zoonoses in India.

1.2 ZOONOSES IN INDIA

Zoonotic diseases pose an especially important public policy challenge to India for a range of reasons. Firstly, as described below, despite the challenges in assessing disease burdens and risks, it is accepted by most that India faces a dual challenge of outbreak-causing exotic as well as endemic zoonoses.

India has among the highest numbers of livestock and human populations living in close proximity (Robinson et al., 2014; Thornton et al., 2002), including the highest numbers of livestock owners living in poor, and possibly, unhygienic, conditions (Grace et al., 2012b). In addition, the ecological diversity and rapidity of ecological changes in the country, exemplified by its two 'biodiversity hotspots' (Myers et al., 2000) have resulted in its identification as one of the four global 'hotspots' likely to witness emergence of newer zoonotic pathogens (Jones et al., 2008). Not surprisingly many states in India have reported the emergence or re-emergence of several pathogens over the last two decades (Table 1).

Table 1: Reported outbreaks of some emerging / re-emerging zoonoses in India

Chandipura virus	Tamil Nadu, 1988; Andhra Pradesh, 2003; Gujarat, 2006, 2015; Maharashtra 2012; Odisha 2014(Damle et al., 2017; Dwibedi et al., 2015; Jacob John, 2010; Sudeep et al., 2014)
Crimean-Congo Haemorrhagic fever	Gujarat, 2011, 2012, 2013; Rajasthan, 2014(Makwana et al., 2015; Mourya et al., 2012; Pragya D Yadav et al., 2014; Pragya D. Yadav et al., 2014a; Yadav et al., 2013)
Avian influenza	Various states, 2006 – 14
Japanese Encephalitis	Uttar Pradesh, 2005, 2009; Bihar & Assam, 2010(Campbell et al., 2011; Parida et al., 2006)
Kyasanur forest disease (KFD)	Karnataka, 2011, 2012, 2014; Tamil Nadu, 2012; Kerala, 2014; Goa, 2016; Maharashtra, 2016(Gurav et al., 2018; Kasabi et al., 2013; Murhekar et al., 2015; Sadanandane et al., 2017; Pragya D. Yadav et al., 2014b)
Nipah virus	West Bengal, 2001, 2007; Kerala 2018(Chattu et al., 2018; Kulkarni et al., 2013)
Plague	Gujarat, 1994; Himachal, 2002; Uttarakhand, 2004(Gupta and Sharma, 2007; Mavalankar, 1995; Mittal et al., 2004)
Scrub Typhus	Multiple years in Himachal Pradesh, North East, Rajasthan & Tamil Nadu(Chogle, 2010; Ganesh et al., 2018; Isaac et al., 2004; Sinha et al., 2014)
Trypanosomiasis (*evansi*)	Maharashtra, 2005(Joshi et al., 2005)

At the same time as being a hot spot for emerging infections, due its size and population density, India has also been identified as a major contributor to the global burden of different endemic zoonoses. Many of these endemic zoonoses are also referred to in the global health literature as 'neglected zoonoses' (Maudlin et al., 2009) because of their associations with poverty and lack of scientific studies.

A complicating factor for zoonoses is the uncertainty surrounding the disease incidence as well as identification of appropriate control strategies. For example, in the case of rabies, multiple studies conducted over two decades have shown India to account for the largest share of the global burden of rabies. (Hampson et al., 2015; Knobel et al., 2005; Sudarshan et al., 2007; Suraweera et al., 2012) However, even a relatively well-studied zoonosis like rabies continues to be referred to as a neglected disease because of lack of epidemiologic information (Taylor et al., 2015) and policy hesitancy on part of decision-makers (Kakkar et al., 2012; Lembo et al., 2010). This, in turn, is possibly due to the disconnect between the information needs of the decision-makers and the research output produced in the country (Abbas and Kakkar, 2013).

Even more than rabies, very limited epidemiological information exists for other zoonoses endemic to India. Systematic reviews seeking to estimate global disease burden of diseases like brucellosis (Dean et al., 2012) and bovine tuberculosis (Müller et al., 2013)

continue to depict the Indian subcontinent as white spaces in their maps denoting lack of sufficient epidemiological studies. On the other hand, based upon existing smaller studies, current scientific opinion points towards a significant burden of these diseases in India. (Bose, 2008; Dhand et al., 2005; Grace et al., 2012b; Smits and Kadri, 2005; Thappa and Karthikeyan, 2001)

This wider debate on public health policy and practice intersected with my own experience working in India, and in turn resulted in the definition of the research question for this thesis, as discussed below.

1.3 PERSONAL MOTIVATIONS

As a public health researcher in India working on zoonotic diseases since 2008, I had been exposed to many of these discussions. The term One Health itself wasn't particularly common in the country at the time. However, over the years most people in the infectious diseases community in India, including researchers and government officers, had started acknowledging the importance of animal-human linkages in disease transmission, especially for well-reported diseases such as avian influenza, even if the mechanisms for fostering such collaborations remained vague.

I personally began to recognise the importance of multisector partnerships after participating in a discussion on rabies control in the southern Indian state of Tamil Nadu in 2011. I was a part of the organizing team for what was essentially a discussion structured around our assessment of Tamil Nadu's rabies control efforts. (Abbas et al., 2011b) However, soon after the discussions started we realised this was possibly the first time that the experts and government officers from national and state level had come together to discuss rabies policies in a non-academic, non-government setting in India.

The result was an enthusiastic exchange of ideas and opinions among the participants hailing across different sectors (animal, human, municipality, environment), functions (programme manager, policy maker, researcher, donor) and administrative levels (state, national, regional). We realised that there were many differences in different actors' perspectives and commitment to the key rabies control interventions and discussed how best to accommodate these differences in designing rabies control policies.

We got good feedback from the discussants afterwards and the meeting resulted in a recommendation document, several proposals and publications (Abbas et al., 2014, 2011a; Fitzpatrick et al., 2016; Kakkar et al., 2012). However, the major takeaway for me was the realisation that collaboration did not mean that collaborating actors should all agree on

the same problem definition; rather the challenge was to develop a shared vision that accommodates the difference in individual perspectives.

The insights on local decision-making I gained from my work in India played an important role in influencing my choice of discipline and research question for my PhD. In my readings around zoonoses and One Health, I had come across multiple documents highlighting the need for working together on the grounds of increased efficiency, effectiveness and as a political response to the upcoming series of health threats. (Coker et al., 2011; Rushton et al., 2012; Zinsstag et al., 2007) However, most of the papers, even those authored by veterinarians, seemed to be making the case from the human health perspective, with little discussions on the rationale for veterinarians to collaborate.

In addition, at the time of starting my PhD I had found very little discussion around the mechanics of building such a cross-sector collaboration.[2] Indeed, beyond defining One Health, there seemed to be no acknowledgment of the different kinds of collaborations that could emerge at the national and sub-national levels. (Lee and Brumme, 2012)

I therefore felt that, despite my training as a physician and public health researcher, I needed to go beyond the health sector needs in order to get a more complete understanding of multisector collaborations, and consequently, chose to base myself at a social science research centre with expertise in conducting research around cross sector issues and zoonoses.

1.4 RESEARCH QUESTION

The research question that I proposed for my PhD was therefore:

Under what conditions do intersectoral collaborations for prevention and control of zoonoses in India occur (or don't)?

In order to gain a comparative insight into 'conditions' I decided to compare two very different states in India: Gujarat and Tamil Nadu (see chapter 3). Focusing on the state level makes sense for two reasons. First, within the federal structure of India, the state governments enjoy jurisdiction over the animal and human health sectors, and, consequently, the administrative units at the state level are often sites for bureaucratic and political innovation (Deshpande et al., 2017). Second, different states as a

[2] As I describe in subsequent chapter 2, by late 2013, there were some documents from international agencies that attempted to describe the difficulty of establishing multisector collaborative mechanisms, but these seldom went beyond boilerplate understandings of multisectorality. Examples include (Khabbaz, 2010; The World Bank, 2010; World Health Organization et al., 2014).

consequence have long histories of practice, within a broad umbrella of federal policy. This means that the cultures, practices and experiences of state level bureaucracies, and their engagement with national and international science and policy can be quite different. Chapter 3 explains the contrasts between my study sites, and how these illuminate contrasts in 'conditions' for collaboration.

In exploring 'intersectoral collaboration', I have taken a broad definition, encompassing both formal and informal processes. In the rest of the thesis, I use the terms collaboration and partnership and multisectoral and intersectoral interchangeably. While I do cite other researchers who have been strict in their use of these terms, I argue that these rigid categorisations were not pertinent to my research because my aim was to unpack the development and functioning of such inter/multisector collaborations/partnerships rather than develop a framework for evaluating their performance. In sum, I am interested in how different groups of people (or individuals) come together across institutionally defined sectors to tackle zoonotic disease issues, whether through formal or informal means, whether mandated by policy or institutional mission or not; whether sustained over time or just a one-off event, and whether formally part of a job description or part of everyday practice. Moreover, instead of studying the performance of existing cross-sector partnerships, which is the case with most One Health literature, I wanted to make space for selecting other, non-traditional partnerships as well, which could be informal or temporary in nature.

I chose three zoonotic diseases (two diseases in each of my two study states) as exemplars around which multisector collaborations could be studied. I explain the rationale for my choice subsequently in chapter 3 on methods.

1.5 THESIS ORGANISATION

Having introduced the research question in this chapter, I use chapter 2 to explain its grounding in the academic literature and key policy debates to lay the conceptual and empirical contours of my research. I have structured chapter 2 according to my analytical framework. Adopting this structure helped me to organize a discussion of literature from multiple disciplines and topics, to demonstrate the development of my analytical framework and to introduce my research sub-questions.

Chapter 3 explains the methods employed to answer my research questions. In addition to discussing my study design, I also discuss the reasons for the methodological choices made and their possible implications on the study findings. These choices include the selection of states and disease as cases and my use of different sources of information. I explain the

reasons for studying collaborations at the state level (and not at national or community level) and my choice of middle-level programme managers as my key respondents. I justify these decisions by explaining how they helped me prioritise inquiry into my focus areas; viz. politics of using scientific expertise by middle-level managers in the aid of their respective agendas.

The next chapter on One Health narratives in India builds upon the first two introductory chapters and provides a national contextual background to the disease-based and state-level case studies presented in the subsequent chapters. The chapter introduces the key national-level actors who are involved in the zoonoses policy discussions at the national level in India and compares their stance on zoonoses and collaborations with the prevalent global discourse. This chapter, therefore, helps bring out the contrast between the global and national rhetoric as well as situates the state level policy debates discussed in the subsequent chapters.

The next three chapters discuss the specific cases of different zoonotic diseases – anthrax, leptospirosis and brucellosis. In these chapters, I present the empirical data investigating the discourses, practices and politics around these diseases in my study states of Gujarat and Tamil Nadu. Chapters 5 and 6 examines the response of state governments to the outbreaks of anthrax in Tamil Nadu and leptospirosis in Gujarat, respectively.

There is another level of comparison present in the case studies. While leptospirosis is understood as a human health problem, anthrax is generally understood as presenting first among the animals. Consequently, the response to outbreaks of both the diseases helps draw up a contrast in the approach of animal and human health agencies. In addition, the analysis of a real time outbreak of anthrax in Tamil Nadu in chapter 5 provides a useful introduction and contrast to the more historical accounts of past outbreaks of leptospirosis in Gujarat in chapter 6. Discussions in both the chapters also highlight the contrast in the administrative cultures of both the states – a theme that is then built up further in the subsequent two chapters.

In contrast to the discussions around the outbreak-prone anthrax and brucellosis, chapter 7 describes brucellosis as being a more widespread, if under-recognised, disease that is common to both the study states. Instead, as recounted in the chapter by several policy actors, in another instance of the different set of incentives operating in the public health and veterinary sector, the push for action by the government came not because of the health burden of the disease, but its impact on the productivity of the economically important dairy sector.

Chapter 8 on collaborations brings together the key themes highlighted in the earlier chapters and compares intersectoral collaborations around zoonoses across diseases and states. The chapter refers back to the analytical framework to organize the discussions around politics, discourse and practices of intersectoral collaborations. It identifies some common threads running across different instances of collaboration allowing collaborations around zoonoses to be analysed and characterised more fully. The chapter concludes by suggesting ways of improving One Health in practice.

2 UNDERSTANDING COLLABORATIONS: LITERATURE REVIEW AND ANALYTICAL FRAMEWORK

The study focus and core question were defined in the previous chapter, this chapter looks at the four key strands of literature that help me to refine and structure my inquiry. These are: disease contexts, discourse around diseases and collaborations, the practices of those involved in collaborations, and the wider politics. First I will elaborate these themes while discussing the literature around these areas and then, subsequently, I will present the analytical framework that emerges out of these themes. These strands do not represent exclusive categories; rather, for the purpose of my thesis, they are best understood as interconnected themes, which are best used as pegs upon which to hang my explanation in a coherent and manageable way.

2.1 DISEASE CHARACTERISTICS

As discussed in chapter 1, zoonotic infections are those which are naturally transmitted between vertebrate animals and humans (WHO, 2010). This catch-all term of 'zoonoses' comprises different kinds of pathogens (bacterial, viral, etc.), transmission routes (food, water and vector-borne), involve various animal species as reservoirs or hosts, and, consequently, affect multiple professional sectors, including animal husbandry, food production, processing and safety, conservation and tourism, veterinary medicine and public health.

Despite the longstanding and widespread interest in zoonoses cutting across multiple professional sectors and academic disciplines (Woods and Bresalier, 2014), we do not know much about most zoonoses, many of which continue to be classified as neglected diseases (Mableson et al., 2014). That zoonoses are a major problem is illustrated by the fact, noted in chapter 1, that approximately two-thirds of all known pathogens and three-quarters of emerging/re-emerging ones have been found to be of zoonotic origins (Woolhouse and Gowtage-Sequeria, 2005).

Zoonotic diseases are generally categorised as being either outbreak-prone emerging/re-emerging infections, or, alternatively as endemic and neglected diseases. The first category of zoonoses includes diseases like Ebola, MERS (Middle East Respiratory Virus), avian influenza and Nipah virus infections. The episodic and fatal nature of these infections, coupled with their rapid transmissibility have caused many to view them as threats to global health security (Hoffman, 2010; Sivaramakrishnan, 2011) and prompted huge

investments in early detection and warning systems against these and similar health threats (Elbe, 2011).

The second category of zoonoses comprises of relatively lesser-discussed diseases that are endemic to geographic areas. These diseases are strongly associated with poverty, disproportionately affect poorer and marginalised populations and have traditionally been referred to as being neglected because of relatively little attention from researchers and policymakers alike. (Mableson et al., 2014; WHO, 2006)

Zoonoses is therefore a catch-all category referring to a variety of disease conditions that can be caused by a variety of pathogens, affect different species, require a variety of interventions, and consequently, might affect the economy and society in a myriad of different ways. While recognizing the variety in zoonotic pathogens and their responses, and the fact that most interventions are still tailored against specific pathogens, for this study I chose a selected number of disease-based case studies, based on their disease-specific characteristics, and use them as illustrative examples to understand the policy challenges posed by them and the resultant policy responses against the identified diseases at the state and local levels (see chapter 3 for choice of diseases).

As referred to earlier, the term zoonoses, refers to a wide variety of infections having different characteristics. Consequently, the policy response inspired by different zoonoses is likely to vary as well, as described below.

Within infectious diseases, it is generally accepted that epidemic-prone diseases that can adopt a crisis framing are likely to elicit a stronger and more urgent policy response than silent diseases with complicated underlying dynamics (Leach, 2008). Because of the way the threat of emerging zoonoses has been portrayed in academic and popular literature[3], and the international consensus around pandemic preparedness that has emerged over the last two decades (Stöhr, 2002) has resulted in research and policy actors to prioritise pandemic-prone (Leach et al., 2010a; Mehand et al., 2018). Consequently, while research to predict disease emergence in Africa has received hundreds of millions of US dollars in funding, endemic zoonoses resulting in millions of deaths annually continue to be starved of attention and resources (Carroll et al., 2018, p. 872; Grace et al., 2012b, p. 6).

This is also a reason why a biomedical understanding of disease has tended to dominate over more contextual understandings, and is possibly the reason for the research-policy disconnect we see in zoonoses globally as well as in India (Bardosh et al., 2017; Kakkar et

[3] For critical analysis of infectious disease literature, see (Garrett, 2018; King, 2004; Leach, 2008; Weldon, 2001) and section around discourse

al., 2012). This has prompted many researchers to make a case for a more holistic, contextual understanding of the zoonotic diseases (Bogich et al., 2012; Craddock and Hinchliffe, 2015).

Another aspect of epidemic prone diseases that helps influence policy response, and eventual collaborations, is the previous history of disease. Anxieties related to viral haemorrhagic fever outbreaks in Africa, as well as the anticipation of the next influenza pandemic at the turn of the century, were major reasons for increased investments by the United States and international agencies in developing Integrated Disease Surveillance and Response (IDSR) capacities in many counties across the world (King, 2004; Perry et al., 2007; WHO et al., 2003).

Similarly, two high profile outbreaks of Severe Acute Respiratory syndrome (SARS) and avian influenza in the early-mid 2000s built upon these efforts and led to development of pandemic preparedness plans and discussions around intersectoral collaborations (Mounier-Jack and Coker, 2006; Scoones and Forster, 2008). Likewise, within the Indian context, it was the infamous plague outbreak of 1994 in Gujarat, that led to the development of a national disease surveillance programme and which continues to fuel anxieties around disease outbreaks in the state even now (Garrett, 2000; Sivaramakrishnan, 2011; Suresh, 2008).

A focus on disease characteristics encounters a basic lack of epidemiological data on many diseases, especially in places like India. This is further compounded by limited awareness of zoonoses generally and the social context of the diseases specifically (Kakkar et al., 2011b; Paige et al., 2015). Recent studies have demonstrated the importance of social factors in influencing disease risk (Dzingirai et al., 2017a; Scoones et al., 2017) as well as the need for understanding how different understandings contribute to construction of disease knowledge (Waldman et al., 2015; Wilkinson, 2015).The need to acknowledge social realities in disease assessments has prompted some epidemiologists to call for greater engagement of researchers with disease-affected communities and incorporate participatory approaches in epidemiologic studies. (Woo*d et al*, 2012). The characteristics of the zoonotic disease itself, such as ecological settings, affected species, sectors, disease severity, etc. will therefore influence how it is perceived.

Thus, the emerging sub-question, and associated domains of enquiry, all responding to my overarching thesis question posed in chapter 1, can be presented as follows:

Sub question
What are the disease characteristics that influence intersectoral collaborations at the state level?
Key domains of enquiry:

- Epidemic vs endemic
- Species affected
- Local outbreak histories

2.2 POLITICS

Collaborations play out in particular political and policy contexts. In this thesis I explore cases in both Gujarat and Tamil Nadu. Drawing on literatures in political science and public administration, I wish to ask questions about the historical origins of these states, as well as contemporary political economy, and how these factors shape state bureaucracies, through historical legacies, revenue flows, policy priorities and capacities. I, in turn, focus on the nature of state bureaucracies, and how these are constituted in a federal system, with implication for state capacity, role of technical advice, and incentives to collaborate and innovate. While within one nation state, the separate states of Gujarat and Tamil Nadu, with different histories, capacities and bureaucratic cultures, have, I hypothesise, different approaches to intersectoral collaboration around zoonotic disease. The literature discussed below informs my analysis.

Even in an era of increased globalism, where localities provide the venue for multiple relational factors to come together, the importance of place-based, relational politics has been highlighted in India as well as elsewhere (Amin, 2004; Dirlik, 1999; Harriss et al., 2005). However, the importance of conducting comparative analysis of state level politics becomes even more important in the context of India where cultural and political diversity among the states has resulted in some scholars referring to it as a 'laboratory' for comparative political analysis (Harriss, 1999, p. 3367), and led others to call for "research on how and why things vary so much from state to state" (Manor, 2010, p. 514).

Comparative politics researchers like Sinha (2004, 2003) and Tillin (2017, 2013) have compared the functioning of political regimes in different states in the light of increased federalism in India. If political ideologies are reflective of social concerns and provide a framework for organizing political behaviour (Jost, 2006, p. 653), some political scientists argue that the diversity in Indian states' social and economic history has resulted in states' adoption of differing political ideologies, and consequently, in different patterns of performance on the public policy front (Ghatak and Roy, 2015; Joshi and McGrath, 2015; Sinha, 2004) (also see Table 2).

Table 2: Comparison of politics and policies of study states

State	Political regime	Development priorities	Rankings[4]
Gujarat	• Conservative, majoritarian • Consistently in power since 2001	• Facilitative role of government • Promoting capital investments and community-based collectives • Examples: – Dairy cooperatives: Amul – Self Help Group: Sewa	• Population 9/29 • Economy 3/33 • HDI 8/18
Tamil Nadu	• Linguistic & Technocratic populism • Power alternating between two political parties	• Universal social welfare • Examples – Mid-day meals in schools – Health insurance	• Population 6/29 • Economy 2/33 • HDI 6/16

Tamil Nadu, for instance, has espoused a distinct form of populist political ideology referred to as 'Dravidianism'. *Dravida* politics emphasised a regional Tamil identity in opposition to the Hindi-speaking and centralising influence of national government in Delhi. In the initial days, the leaders went as far as proposing accession from Indian republic (R. L. . Hardgrave, 1965; R. L. Hardgrave, 1965). The *Dravida* movement proved immensely successful in the state, with political power alternating exclusively among two *Dravida* parties in successive elections so far. As a result of competitive politics, aided by a well-motivated bureaucracy, Tamil Nadu has pioneered and successfully implemented many welfare schemes that went on to be replicated nationally. These include mid-day meal scheme for pre-school and in-school children, subsidised canteens and universal health insurance, among others (Rajendran, 2013; Rajivan, 2006).

Politics and administration in Gujarat, on the other hand, are informed by a qualitatively different political ideology from that in Tamil Nadu and have, consequently, resulted in a different set of social priorities and understandings on how to achieve these. In contrast to the relatively egalitarian populism practised in Tamil Nadu with an emphasis on efficient delivery mechanisms, Gujarati politics has more neoliberal and majoritarian inclinations (Joshi and McGrath, 2015, p. 473).

As Spodek (2011) recounts in his book on the state capital of Ahmedabad, even in pre-independence India, politics was traditionally patronised by the mill-owning merchant class whose interests were influential in the development of political priorities in the state. Perhaps also influenced by the popular notion of caste-based networks of entrepreneurial culture in Gujarat, the traditional form of politics privileged economic growth using 'trickle-down' principles over universal welfare schemes (Dixit, 2010).

[4] Rankings calculated among different combinations of Indian states and Union Territories. Sourced from (Suryanarayana et al., 2016; Wikipedia Contributors, 2018a, 2018b)

Following a set of recombinations of caste dynamics by political parties in the 1970s and changing expectations, there were a series of major Hindu-Muslim riots in the state, and a shift towards majoritarian politics. This meant that the state prioritised development of an established as well as an aspiring middle class (mostly Hindu upper castes) at the expense of the weaker groups in the state, such as the muslims, dalits and adivasis (Jaffrelot, 2015).

While Gupta (2010) describes Tamil Nadu as a model for public health policies to other Indian states, Visaria (2014) explains the amount of catching up Gujarat needs to do to bring its health outcomes at par with other similar states. Indeed, the paradox between the states' "*high growth and low welfare*" runs throughout Hirway et al's essay collection, provocatively entitled "Growth or Development: Which way is Gujarat going?" (2014, p. xxiii).

This diversity in state politics has been enshrined within the constitutional demarcation of powers as well. As described in Table 4, most sectors relevant to zoonotic diseases come under the jurisdiction of the state government, thus making zoonoses decision-making more dependent on the local politics of a state.

In addition to the political ideology, the actual performance of the government will depend upon having an effective administrative machinery at its disposal, making the study of bureaucracy indispensable to any analysis of public policy discussions. Given the federal character of the Indian republic, and its British colonial past, it was thought by the country's founding fathers that its governance needed the presence of an impartial generalist cadre of highly privileged administrators, who carried on the traditions of the colonial Indian Civil Services (Potter, 1996, 1986).

The conventional view of bureaucrats as policy elites sees them as privileged and dominant, and not subject to the pressures of politics as the normal citizenry is (Shurmer-Smith, 1998). Pederson (1992) argues for a more nuanced understanding of these groups. Indeed, as any close examination even within the privileged Indian Administrative Service (IAS) cadre in India shows, bureaucrats come with different temperaments and backgrounds and, by the virtue of working within a highly politicised system and a rigid hierarchy, are subject to political pressures of different orders of magnitude (Gupta, 1990; Saxena, 2010).

Studies tracking career progression of IAS officers have pointed to the role played by political pressures in influencing their assignments and tenure (Iyer and Mani, 2012; Vaishnav and Khosla, 2016). Ethnographic studies of bureaucracies echoes Pederson's

claims above and demonstrate the limited nature of power exercised by the bureaucrats (Gupta, 2013, 2012).

Therefore, in a system where bureaucrats themselves become tools for advancement of political objectives of the ruling regimes, it is important to study the mechanisms through which politics affects decision-making at multiple levels and in different states. While the IAS are supposed to be a generalist cadre of senior level bureaucrats, they are assisted in decision-making by parallel cadres of technical professionals. These include veterinarians in the Department of Animal Husbandry and public health experts in the Department of Health. Officers from technical cadres are generally ranked lower in the bureaucratic hierarchy compared to IAS officers.

The importance given to advice of technical specialists tends to vary from state to state, and is often a function of the political culture prevalent in a state. For instance, Tamil Nadu politics is known for its strong emphasis on effective delivery of its welfare services, and therefore, enjoys a reputation for strong bureaucracy (Gupta et al., 2010; Malaney, 2000). Gujarat, on the other hand, still retains memory of international shame and economic losses following the 1994 plague outbreak (Garrett, 2000; Sivaramakrishnan, 2011). This is possibly the reason why its achievements in controlling disease outbreaks seem to be equally focussed on controlling the narrative as much as the disease itself. This is best illustrated by the government's decision to suppress news of Zika cases in India as the cases occurred at the same time as a major investment conclave (Biswas, 2017).

The technocrats often provide the scientific justifications for what are inherently political decisions. In addition to negotiating a politically acceptable decision with the politicians and a technically appropriate one with the scientists, these 'middle-level' bureaucrats can also be seen as conducting the necessary, but often invisible, work of operationalising a new policy initiative. As discussed in the section 2.4 on practices, below, these professionals bear resemblance to the control room operators managing policy messes.

The discussion above, thus, identifies several issues relevant to developing an understanding of the intersectoral collaborations existing at the state level. The importance of actor networks in interpreting and influencing policy narratives is especially important, given the governance architecture in India. The prevalent political and administrative cultures of the state will influence the relative priorities accorded to developmental and community concerns as well as the quality of response to these concerns. During the thesis, I will examine the role of the abovementioned factors in influencing the development of intersectoral collaborations for zoonoses prevention and

control in the two study states, suggesting the following sub-question and domains of inquiry:

Emergent Sub-question:
How do the local political and administrative cultures influence intersectoral collaborations at the state level?
Key domains of enquiry:

- State history and politics
- Bureaucratic cultures
- Institutional capacity

2.3 DISCOURSES

Policy making around zoonotic diseases requires navigating a wide range of stakeholders with varying nature and levels of interest. In such a context, any policy issue (such as burden of disease, or costing of interventions) will elicit contested understandings with different actors likely to draw upon their own interpretations based upon the nature of their interests and the type of information they have access to.

As zoonotic disease discussions require a specialist expertise, in order to study policy outcomes, it is worth interrogating more closely the processes through which this 'exclusive' information gets eventually translated into action.

Other researchers investigating themes involving similar levels of information asymmetry and diversity of interests, such as environment policy and sustainability, have also pointed to the discretionary use of power in the knowledge to policy translation process (Hajer, 1997; Keeley and Scoones, 1999).

Scholars such as Fischer and Forrester (1993) and Roe (1994) highlight the importance of narrative stories and framings in communicating policy ideas. Simple storylines – with a beginning, a middle and an end – can encapsulate the way problems are defined and solutions are proposed by different actors. Discourses – and their associated narratives - are thus 'framed' according to different power-knowledge configurations, requiring an analysis of who says what and why.

However, the very act of reducing the complexity of reality to simpler framings is an exercise of authority, with the actors conducting the translation, exercising their authority. This act of interpreting evidence is in equal parts science and politics, and is mediated by power and practice. I explore the challenges of translating science and choosing evidence further in my thesis. Some concepts I draw upon include discursive analysis and narrative policy analysis (Fischer, 2003; Hajer and Versteeg, 2005; Roe, 1994). There are also

examples that call into question multiple versions of the same story and we need to ask whose story counts, including the tensions between so-called high and low sciences (Campbell and Lee, 2003).

Shore *et* al, drawing upon Foucault, describe policy as 'political technologies' whose "*political nature is disguised by the neutral, legal-rational idioms in which they are portrayed*". This is because, according to them, "*the veiling of political power under the cloak of legal rational neutrality is a characteristic feature of modern power*" (Shore et al., 2011, p. 171). Accordingly, the identification and analysis of the power operating behind the translation process will be central to my analysis using this framework.

Several social scientists have applied the lens of discursive inquiry to zoonotic diseases debates. They have described how both zoonotic diseases themselves, as well as the interventions proposed to address them were framed selectively (Craddock and Hinchliffe, 2015; Dingwall et al., 2013).

One particular framing of zoonoses dominated policy discourse in the early 2000s. As discussed in chapters 1 and 4, at the time the international community was anticipating the next pandemic and there were fears if it turned out to have characteristics of Ebola-like virulence and transmissibility, and arising from countries with limited capacities for detection and response (Tomes, 2000; Weldon, 2001).

The silent manner in which SARS was allowed to spread in China and the international 'haggling over viruses' that occurred in the aftermath of avian influenza outbreak in South East Asia only served to highlight the global security implications of such outbreaks (Elbe, 2010; Forster, 2014).

As described by Cassidy (2018), several policy entrepreneurs who were already working on transboundary and wildlife diseases, capitalised on the policy window that had opened up to newer ways of addressing outbreaks of emerging infections. Their framing of disease emergence as a predictable and (by implication) controllable phenomenon (Jones et al., 2008; Wolfe et al., 2007, 2005) became the dominant framing. It displaced alternative framings from social scientists that looked at zoonotic diseases as social constructs (Leach et al., 2008; MacGregor and Waldman, 2017) or those from epidemiologists that framed zoonoses as products of socio-ecological systems (Catley et al., 2012; Zinsstag et al., 2011) and those that portrayed zoonoses as being diseases of poverty (Grace et al., 2017; Perry et al., 2011).

The various solutions proposed to address zoonoses, not surprisingly, emerged from the way the 'problem' of zoonoses was framed in the first place. Therefore, framing of

zoonoses as outbreak-prone emerging diseases, led to international research investments aimed at predicting disease emergence by screening millions of viruses in 'hot-spots' at increased risk of disease emergence (Carroll et al., 2018; Jones et al., 2008; Morse et al., 2012).

The global health community, on the other hand, appeared to be concerned more with the global health security implications of zoonoses and emerging infections. Accordingly, this led to huge investments in strengthening disease surveillance and response capacities in the last two decades. For instance, much of the work on disease surveillance was conducted under the intellectual leadership of the American Centers for Disease Control (CDC) (Calain, 2007; Katz et al., 2011; WHO, 2003) and led to the establishment of CDC like institutions in Europe, China and India.

As introduced in chapter 1, a key aspect of discussions related to prevention and control of zoonoses was a widely expressed intention of establishing intersectoral collaboration between animal, environment and human health sectors. This is not a novel development in itself. Scientists have been advocating collaborative relationships between animal and human health practitioners at least since the mid-nineteenth century when the term zoonosis was first coined by Virchow (Schultz, 2008) and possibly even earlier (Woods and Bresalier, 2014). The term 'One Medicine' was popularized in the mid-twentieth century building upon these discussions (Schwabe, 1984) (see also chapter 1). Table 3 offers a characterisation of a series of 'convergence movements', each offering discourses on collaboration from different standpoints.

Table 3: A brief overview of principle convergence movements related to zoonoses

Convergence movement	**Leading sector/agency**	**Focusing issue**
One medicine	Veterinary sector	Medicine – Veterinary collaborations
Conservation medicine	Wildlife ecologists	Wildlife – Human health synergies
Ecohealth	IDRC; Ecologists, Agronomists & Veterinarians	Research for development
One World One Health ™	WCS; Wildlife scientists	Wildlife origin health threats
One Health	Originated from above, now co-opted by multiple agencies	Emerging disease focus / Techno-centric approach
Planetary Health	Public health, Ecologists	Environment health as a determinant of human health outcomes

Other approaches seeking convergence between animal and human health sectors, such as ecohealth (Waltner-Toews, 2001; Waltner-Toews and Wall, 1997) and conservation

medicine (Aguirre et al., 2012), had been initiated by veterinarians and ecologists over the last few decades, one can argue, with limited human health sector buy-in.

Following the SARS and avian influenza scares in early 2000s, these concepts gained an increasing acceptance by the principal UN and technical agencies under the umbrella of 'One Health' (CDC, 2013; United Nations, 2008). Planetary health is a new development that aims to increase the importance of managing environment (including socio-ecological systems) as a way of ensuring human health in the Anthropocene epoch (Seltenrich, 2018; Whitmee et al., 2015)

As discussed in chapter 1, One Health is a newly coined term (Gibbs, 2014) that evolved due to exigent policy imperatives for responding to emerging infections (Karesh and Cook, 2005). Therefore, for much of its history, it has been interpreted differently by different stakeholders without the benefit of an overarching conceptual vision. Over the years, several different conceptualizations emerged that tried to develop a sense of identity to the one health movement. The earliest set of discussions were in high profile meetings (CDC, 2010; Public Health Agency of Canada, 2009) in the immediate aftermath of SARS and H5N1 outbreaks that tried to define what was the scope of one health.

Coker and colleagues (2011) utilised a programme theory approach for categorizing the kinds of domains that researchers can look into under the One Health umbrella. On the other hand, Wood and colleagues (Wood et al., 2012) used elements of the STEPS pathways approach (Leach et al., 2010b) and an epidemiologic perspective to develop a framework for exploring complex zoonoses emergence pathways. Zinsstag *et al* (2011) applied the lens of complexity thinking to combine Schwabe's (1984) 'One Medicine' and Ostrom's (2007) social-ecological system models to propose a framework for studying how health is influenced by other factors in social-ecological systems.

However, despite the long history of the convergence movements described above, getting the sectors to come together remains a difficult goal to achieve. This is because of both philosophical as well as practical differences of ownership and operating incentives that prevent the sectors from coming together, as depicted in Table 4.

While the human health sector works to promote human well-being and the environment health sector works on conservation issues, the animal health sector works to increase food production and food safety towards economic development. The differing goals, fractured ownerships, disciplinary rivalries and rigid bureaucratic silo-based functioning of these sectors mean that frequently cross-cutting issues such as zoonoses end up 'falling through the regulatory cracks' (Schmidt, 2009) and cooperation remains a distant goal.

Table 4: Contrasting the principle sectors related to zoonoses in India

Sector	Underlying disciplines	Operational incentives	Nodal Ministry	Jurisdiction[5]
Animal Health	Veterinary Medicine, Veterinary Public Health	Food safety Food production Economic growth Animal Welfare	Department of Animal Husbandry, Dairying & Fisheries	State list
Environment Health	Conservation biology, Veterinary Medicine	Species conservation Animal Welfare	Ministry of Environment & Forests	Concurrent list[6]
Human Health	Medicine, Public Health	Human well-being	Ministry of Health & Family Welfare	State list

While One Health approaches gathered steam, there have been several criticisms launched against the ways in which it has been put into action. For one, despite the increased mobilisation around pandemic preparedness and increased awareness around zoonoses, the global One Health narrative lacks 'proofs of concept' from national-level experiences. One Health proponents continue to organize meetings around the themes of 'Operationalizing One Health' (CDC, 2010) and finding 'Cross Sectoral Solutions' for infectious diseases (Prince Mahidol Awards Conference, 2013) but, apparently, have little to show for it (Lee and Brumme, 2012; Valeix, 2014).

As shown in a recent bibliometric network analyses, One Health discussions remain dominated by relatively small number of actors (Galaz et al., 2015; Valeix, 2014). There is limited country buy-in, as evidenced by lack of country case studies (Lee and Brumme, 2012). Despite calls for transdisciplinary training to tackle emerging infections, (Parkes et al., 2005) and the launch of small learning platforms (McKenzie et al., 2016), medical (Kakkar et al., 2011b)and veterinary training (Kakkar et al., 2013) remains silo based in India.

The dominant convergence narratives often highlight threats faced from the emerging zoonoses, ignoring their endemic nature within their natural habitats and they propose technical solutions that did not take into account the existing social contexts of these diseases (Leach and Scoones, 2013).

Similar analyses of the local relevance of collaborative approaches have been undertaken within India as well. As demonstrated by a bibliometric analysis of research conducted on

[5] As described in the Seventh Schedule of Indian constitution demarcating the powers of the federal and state governments (Ministry of Law and Justice, 2018)
[6] Refers to areas that come under the joint jurisdictions of Central and State governments

zoonoses in India, most of it tends to focus on biological factors and developing technical interventions that are divorced from the national policy requirements that are more to do with systems and policy research and research on improving effectiveness (Kakkar et al., 2012).

As noted above, there has been a reaction to the emergence of a powerful One Health narrative at the global level. Various counter-narratives are evident. One, supported by data on publishing trends, posits that One Health is a global imposition, dominated by a select group of northern country researchers and policymakers and, as in many international development initiatives, can divert funds away for much-needed local, sectoral work (Galaz et al., 2016). Another critical narrative questions the basic framing, asking 'whose world, whose health?', pointing to questions of power and inequality (Hinchliffe, 2015).

This thesis will focus in on an examination of the policy discourses around intersectoral collaborations for zoonoses prevention and control, focussing upon two states in India, exploring the intersection of global and local discourses. In particular, I will investigate the multiple interpretations of the "problem" of zoonoses and the proposed "solutions" around collaborative approaches at different administrative levels and among different sectors. In turn, I will l study the perspectives of different sectors in approaching zoonoses and collaborations for different types of zoonoses across two states.

The emergent sub-question, and associated domains of enquiry, can be presented in the following way:

Emergent Sub-question:
How have the understandings around zoonoses and collaborative response approaches developed in the study states?
Key domains of enquiry:

- Local priorities
- Scientific expertise
- Storylines

2.4 PRACTICES

The concept of intersectoral collaboration is certainly not confined to zoonoses alone. Collaboration, partnership and integration are closely related concepts that have been applied in many other health as well as non-health settings, such as nutrition, sanitation, and social determinants of health (Cairncross et al., 2010; Garrett et al., 2014; Mcqueen et al., 2012). Researchers from many disciplines have also tried to explain these applications

using their disciplinary lexicons, such as management and public affairs (Bryson et al., 2006; Tennyson et al., 2008; Wood and Gray, 1991).

However, in these discussions, the question of how collaborations emerge is rarely touched upon. There has been a widespread debate about the importance of changing practices – and associated behaviours, institutional mandates and policies – to encourage collaboration. This has been discussed in literatures on public health, nutrition and public administration (Bryson et al., 2006; Harris and Drimie, 2012; Rasanathan et al., 2017).

Within the health sector itself, apart from the convergence movements, discussed earlier, multisector collaborations have been highlighted for addressing the social determinants of health. This has inspired discussions around Intersectoral action for health (Rasanathan et al., 2017), as well as around the concept of 'Health in All Policies' (WHO, 2013). As exemplified by the experiments to tackle social inequalities in England, these experiences did not always succeed in securing engagement from non-health sectors despite the visibility accorded to the policies (Exworthy et al., 2003; Exworthy and Hunter, 2011). Explanations have focused on the practices of the actors involved, as well as the wider institutional and policy environment.

Nutrition is another sector that has a long history of advocating for mainstreaming or integrating of nutrition, agriculture and health policies since the 1970s (Berg, 1987; Harris and Drimie, 2012), despite persistent concerns around feasibility and lack of ownership from the implementing actors (Field, 1987). Several scholars have proposed collaboration be described based upon the degree of integration. This views collaborations on a sliding scale ranging from independent silo-based functioning to sharing of information, to conducting activities together and finally, merging resources and infrastructure (Grépin and Reich, 2008; Harris and Drimie, 2012; Shigayeva et al., 2010).

Public administration scholars such as Agranoff (2013) have proposed concepts like intergovernmental relations that relate to the informal network of actors and negotiations engaged with them by local government agencies to execute their mandates. Others such as Bryson *et al.* (2006), Thomson & Perry (2006) and Emerson *et al*. (2012) have developed overarching frameworks for institutional collaboration that focus on themes like mutuality, co-dependence and prior relationships as affecting the scope and length of collaborations.

Management researchers, Huxham and Vangen (2004), describe both the 'advantage' and 'inertia' as possible effects of collaboration. Hardy *et al*. (2003) analyse the drivers behind three key effects produced as a result of organziational collaborations; namely, strategic

effects, knowledge creation effects and political effects. Lawrence *et al.* (2002) hint at transformative implications of collaborations and propose the the generation of proto-institution as a possible effect upon the collaborating organziations thesmelves. I use this stream of literature to broadly inform the practices of collaboration, but use another body of work for a more nuanced and political understanding of collaborative practices, as described below.

In this thesis, I focus on the practice of collaboration, both formal and informal. By 'practice', I refer to the usage by Wagenaar and Cook (2003, pp. 2–3) who argue for the central place of action in policy analysis. Practice, they argue, has its own logic; it is a part of "phronesis or practical reason", which is distinct from scientific or technical reason. I do not aim to make use of 'practice theory' formally, but in many respects the approaches have informed my understanding, as explained below. I am interested in exploring, through an ethnographic lens that encompasses both the formal, procedural and routinized and the informal, everyday and serendipitous, how the practices of bureaucrats, field agents, scientists, policymakers and others create, or impede, collaborations across sectors for the purpose of disease prevention and control.

For the purpose of my study, I draw upon the concepts of the everyday state and everyday practices, as they relate to intersectoral collaborations for prevention and control of zoonoses. While both draw upon similar themes of informality and individual agency, they apply to certain different contexts. The concept of the everyday state in India draws from an anthropological understanding of how the state functions at the state-citizen interface (Fuller and Bénéï, 2001), and questions the 'blurred boundaries' between the state and citizens (Gupta, 1995). According to this conception, instead of working as "faceless automatons in the Weberian mould", government officers were themselves part of the society, and reflected its social and political biases in the workings of the local government (Corbridge et al., 2003, p. 2379).

A separate, but related, conceptualisation of the citizen-state interface is offered by authors such as Kaviraj (2012). This emphasises the differences between the ruling elites and the underprivileged vernacular citizenry. Given the differences in their world views (and privilege), the ruling elites might not always know what best works on the ground. Accordingly, "*we should expect lower-level public officials to reinterpret and sometimes significantly to change the practices of government that are handed down to them by Indian Administrative Service (IAS) officers at the District, State or Union levels*" (Corbridge et al., 2005, p. 5).

The themes of reinterpreting policy at the local level and the exercise of discretion by all-too-human bureaucrats are also reflected in the discussions around everyday practices. As described by Wagenaar (2004), the focus seems limited to the study of large bureaucracies; for instance, as in discussions of street-level bureaucrats by Lipsky (2010). Such bureaucrats have to make decisions to ensure client needs are met and the larger policy goals are achieved, even if that requires creative interpretation of the implementing guidelines. In a similar vein, Gupta (2012, p. 9) also cites an instance in his ethnographic portrayal of the lower bureaucracy in India where the implementing officer instructs his subordinates to go beyond following the rules to making sure the job gets done.

The reactive ways in which policy makers often seem to function is not a novel observation. Lindblom (1959) characterised policy-making as a practice of 'muddling through'. Others have built upon the analogy, with Roe (2016a, 2013) terming policy making as a mess characterised by:

> *darkening sky of: coping, muddling through, groping along, suboptimization, bounded rationality, garbage can processes, second-best solutions, policy churn and policy fiascos, rotten compromises, managing the unexpected, crisis management, and that deep wellspring of miserablism, implementation and policy failure.* (Roe, 2016a, p. 352)

Roe draws his understanding of reliable management of policy messes from his observations of 'high reliability professionals' – control room managers of critical infrastructure (Schulman et al., 2004). There are several parallels with the decision-making around zoonoses given the environment of uncertainty, and a bounded rationality within which the bureaucrats have to operate. In addition, as most zoonoses discussions require a fair amount of specialist expertise, and often evolves around high-risk events such as disease outbreaks, it is likely that the decision-making process for zoonoses would also be operating like a rarefied 'control room' setting, with a strong role for scientific advice.

Decision-making around zoonoses, therefore, requires constant interpretation and re-interpretation of scientific knowledge in a way that facilitates decision-making for the actor concerned. The implication is each step of decision-making, consultation and implementation essentially becomes a form of agenda-setting (Shiffman and Smith, 2007; Zahariadis, 2007). In such settings, straightforward execution of orders from above is rare, and the opportunities for collaboration may emerge, even if not formally required, through new practices in response to fast-changing situations.

In concluding this section, I return to the wider debate about collaboration, from the existing literature – from fields as dispersed as nutrition (Harris and Drimie, 2012) and

public administration (Emerson et al., 2012; Page et al., 2015; Thomson et al., 2007). Most conceptualisations of collaborations are depicted through an institutionalist perspective without taking into account the underlying networks, relationships and practices that often play catalytic roles in sustaining collaborations.

A range of literatures from fields ranging from anthropology, to political science and public administration point to the importance of the practices of key actors in shaping decisions around diseases (and associated collaborations). In the subsequent chapters, I draw upon practice theory, and an ethnographic lens on everyday life to highlight the importance of the informal, day-to-day responses, especially by front-line managers who have to innovate, improvise and respond to a messy world of non-linear policy and often poorly defined institutional mandates. Various incentives push people towards or away from collaboration, whether this lies in professional training, institutional hierarchies or formal policy. A practice focused approach therefore encourages an exploration of what actually happens and why, and suggests the following sub-question, and associated domains of enquiry:

Emergent Sub-question:
What aspects of formal and informal practices of actors involved in zoonoses prevention control enhance or discourage intersectoral collaboration?
Key domains of enquiry:

- Everyday practices
- Informality
- Adaptive learning

2.5 AN EMERGENT ANALYTIC FRAMEWORK

Key takeaways from literature discussed above include the observation that collaborations do not appear to be mechanistic organizational tools for working; rather collaborations seem to be a product, both of the social as well as institutional politics associated with how specific diseases and associated interventions are framed and prioritized.

Zoonoses is a catch-all term that comprises a variety of pathogens, transmission patters, with different species involved. These diverse characteristics of the disease itself (severity, outbreak potential, species involved, etc.) help determine the nature of collaborative practices developed around them.

As already discussed, the disease characteristics, in turn, interact with the politics of knowledge, of institutions, and the resultant practices, and so influence the presence and

nature of collaborations around an individual or a set of zoonotic diseases. All these facets will differ, I argue, according to the contexts of different states, including their histories, bureaucratic cultures and administrative capacities.

If we are to understand how collaborations develop and sustain (and so answer my overarching thesis question), we will need to look at the following interrelated themes, linking the themes to the emergent sub-questions and domains of enquiry outlined above.

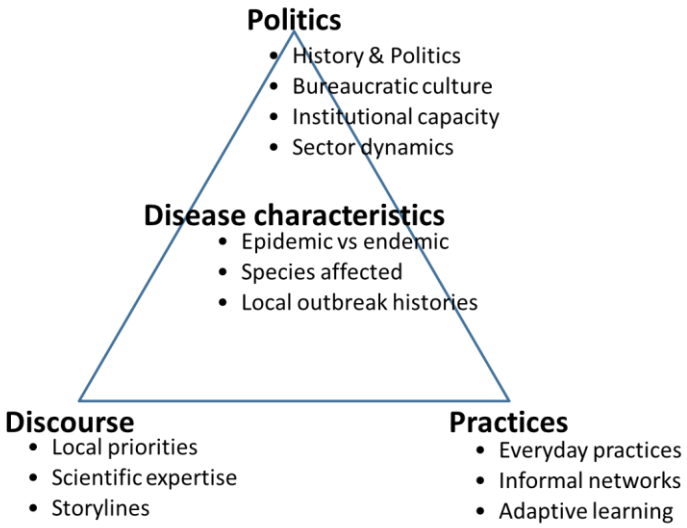


Figure 1: Analytical framework

By revisiting the proposed research question, and with the background of the reviewed literature, we can broadly describe the development and performance of state-level intersectoral collaborations as being influenced by four major sets of factors: viz. disease characteristics; discourses around intersectoral collaboration for zoonoses; the politics of bureaucracy and administration and the practices of key actors. As described in Figure 1, and also elaborated in Figure 3, these factors can explain how states convene and manage collaborations for zoonoses prevention and control.

We expect each of these factors to differ across Indian states for ecological, historical, political, economic reasons. Therefore, the research question and four emergent sub-questions that will be asked for comparatively contrasting Gujarat and Tamil Nadu are as follows:

OVERARCHING QUESTION

Under what conditions do intersectoral collaborations for prevention and control of zoonoses in India occur (or doesn't)?

SUB-QUESTIONS

1. **Disease characteristics:** What are the disease contexts that influence intersectoral collaborations at the state level?
2. **Politics:** How do the local political and administrative cultures influence intersectoral collaborations at the state level?
3. **Discourse:** How have the understandings around zoonoses and collaborative response approaches developed in the two study states?
4. **Practice:** What aspects of formal and informal practices of actors involved in zoonoses prevention control enhance or discourage intersectoral collaboration?

3 METHODOLOGY

Having introduced my research question and analytical framework in the earlier two chapters, I will now describe the strategies I adopted for answering my research question. Broadly, the aim of my study was to develop insights into the development and performance of multisector partnerships developed for prevention and control of zoonoses in India. I have sought to respond to this aim through a comparative assessment of disease-based collaborations operating at the state level in India.

Drawing upon the four analytical themes identified in the previous chapter, I want to understand the role of disease characteristics, framings of the diseases themselves, the underlying politics and, finally, the practices on the ground in giving shape to animal-human health sector collaborations. Given the specialist nature of zoonoses discourse, my focus in this study was on the knowledge, practices and relationships between the technical experts and decision-makers working on zoonotic diseases within the public health and veterinary sectors.

I adopted an ethnographic approach, and focussed my efforts on developing an understanding of institutional and practical responses to zoonoses in India, focussing on key decision-makers in my two study states, Gujarat and Tamil Nadu. I accomplished this by spending a period of fifteen months spread across three field trips to India between January 2015 and March 2016. In this chapter, I will, provide details of the study design and explain the reasons for my choices, citing methodological literature and practical realities.

3.1 STUDY DESIGN

I used a comparative case study design in order to examine the policy response elicited around two exemplar zoonoses each in both of my study states in India. Answering the research question required me to choose a methodology that allowed deep investigations into the dynamic process of decision-making around zoonoses, often made in conditions of uncertainty. The case study approach was particularly suited for my research, as shown by the definition of a case study as "*an empirical inquiry that investigate a contemporary phenomenon in depth and within its real life context, especially when the boundaries between the phenomenon and context are not clearly evident*" (Yin, 2009, p. 18).

The reason for designing my research as a multi-sited case study was to exploit the differences in the states "to address a broader range of historical, attitudinal and

observational issues", develop "multiple converging lines of enquiry" and allow presentation of "full variety of evidence" (Hamel et al., 1993; Yin, 2009, pp. 118–9).

I specifically chose to study decision-making around zoonoses at the state level, as opposed to national and district levels. This was for multiple reasons. As discussed in the previous chapter, there is considerable variation in health (animal and human) administration among the Indian states, due to the federal distribution of powers, the importance of place-based politics and distinct cultures of administration operating at the state level (Deshpande et al., 2017; Manor, 2010; Ministry of Law and Justice, 2018).

While public health and agriculture fall under the jurisdiction of state governments, and therefore are state government responsibilities, the local bureaucracy and government are seen to be more politically accountable in ways that federal bureaucracy and political leadership are not (Bardhan and Mookherjee, 2005; Corbridge et al., 2005; Mookherjee, 2014). This makes state governments more likely to try out newer ideas in health administration, such as 'One Health', and therefore offer richer insights into the process of collaboration. The reason for selecting two study states for comparison, was to maximise the variations in place-based factors, such as political preferences, administrative cultures, as well as disease ecologies, and examine their role in influencing collaborative practices.

However, policies or practices do not develop in isolation in the state capitals. The central government agencies in Delhi enjoy access to greater technical as well as financial resources. They have different means of influencing decision-making at state level, including by tying use of centrally funded schemes to implementation of centrally developed programme guidelines (Sinha, 2004). Similar to changes in practice that takes place as policies get translated between national and state levels, policies have a tendency to undergo re-interpretation and modification, due to the informality of practices at a state-citizen interface as well (Corbridge et al., 2005).

Therefore, while keeping the focus on decision-making at the state level, I also investigated the perceptions and practices at the national and district levels as well. While focussing on the state-level activities, I traced the narratives constructed and observed practices around the exemplar diseases across the national, state, district and sub-district levels, comparing across two study states. The aim was to situate the state-level interactions within the multiple framings of collaboration around the selected zoonoses at different levels of administration.

3.2 CASE DEFINITION

I defined my cases as 'instances of decision-making in animal and human health sectors at state level for prevention and control of zoonotic diseases'. I wanted all collaborative instances to include, animal and human health sectors, even if the wildlife sector was not included. This decision is a reflection of the relative size and visibility of the three sectors (See chapter 4, Figure 6). By 'instances', I mean opportunities presented for collaborating around prevention or control of zoonoses at a population level.

Some of the selected cases resulted in formal partnership mechanisms, such as named committees; others were characterized by informal interactions such as personal relationships and informal meeting spaces. The selection of cases also includes one where there was little or no formal collaboration despite awareness about a disease. Also, the instances of collaboration included settings involving discussions of intervention on the ground, rather than merely academic discussions. Therefore, all my cases were based in official agencies charged with surveillance and response in human and animal health sectors, although I did consult other actors, including researchers and farmer cooperatives about their contributions to the discussions.

As discussed in the context of the One Health literature (see Chapters 1 and 2), some diseases, like avian influenza, get more attention in research as well as policy debates. In this study, I wanted to go beyond disease like avian influenza or rabies that have received most attention within research and policy communities in India, so at to explore the diversity of collaborative practices, even among less prominent disease cases.

I wanted to identify diseases that could serve as illustrative, insightful cases that could highlight different aspects of responses to zoonoses as a whole. This is because, while individual zoonotic diseases might differ in epidemiological, ecological and social characteristics, the policy response generally involves some sort of dialogue between a relatively small number of institutional actors and therefore, is likely to follow similar contours. Within each of the veterinary and public health ministries, there is a designated office responsible for conducting surveillance and responding to disease outbreaks. Therefore, even when the diseases differ, the policy response generally involves a similar set of actors, which is the reason why many aspects their responses can be compared.

The reason for opting for two states as study sites was to develop an understanding of how different administrative and political cultures respond to zoonoses. As mentioned before, both animal and human health sectors are classified as state subjects in the Indian constitution (Ministry of Law and Justice, 2018). Therefore, even as all Indian states share

similar administrative and legal frameworks, they have considerable freedom to design their own health programmes, if they have the political interest and resources to do so (Deshpande et al., 2017).

3.3 SELECTION OF STUDY SITES AND DISEASE CASES

I identified the states of Gujarat and Tamil Nadu as my two study states.

Figure 2: Map of India with study states shaded

Both Gujarat and Tamil Nadu are big states with large coastlines. While Gujarat is located in western India, Tamil Nadu is a large south Indian state. Both states enjoy a reputation for strong economic performance and a history of innovative social and development schemes. As described in Table 2 in chapter 2, both are large economies, and demonstrate differently styled, but nonetheless, tangible models of social development. Both states have had experience of reporting outbreaks of zoonoses and other infectious diseases in the past, implying a minimum level of understanding around zoonoses (Refer to Table 1 in chapter 1).

Some health systems researchers have described integrative interventions as innovations (Atun et al., 2010). Both Gujarat and Tamil Nadu have a history of health innovations[7]. The states have been cited as having a well-trained workforce and encouraging novel policy initiatives, so there is a high likelihood of presence of collaborative initiatives.

On the other hand, the two states have had different political regimes; one being dominated by a single nationalist political party, the other by a set of regional parties in

[7] e.g. Chiranjeevi yojana in Gujarat (Mavalankar et al., 2009) and TNMSC in Tamil Nadu (Gupta et al., 2010; Veena et al., 2010)

alternate elections. In addition, social composition of the population in both states is quite different. Both states have therefore chosen to follow different development trajectories, which has a bearing both on the governance systems, as well as social priorities (Joshi and McGrath, 2015).

As I have described in the earlier two chapters, zoonotic diseases are a heterogeneous group characterised by differences in epidemiological and ecological characteristics. Not all zoonoses enjoy the same level of visibility and public attention (Galaz et al., 2016; Leach and Hewlett, 2010). Within the context of both my study states, I aimed to choose two zoonotic diseases, each of which can offer me a lens through which to analyse the decision-making processes.

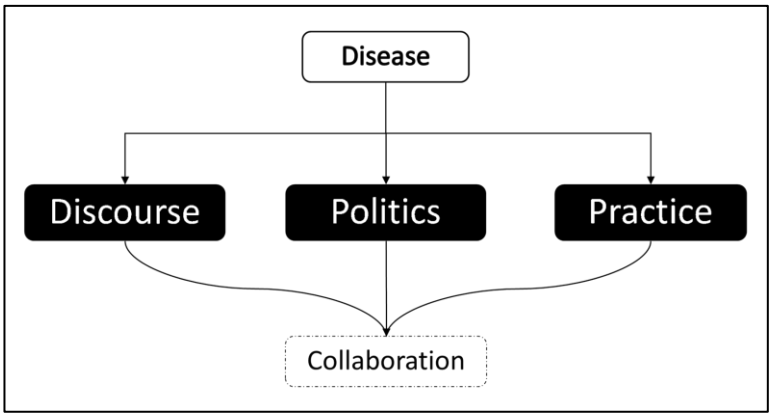


Figure 3: Analytic framework for study

My reason for choosing specific diseases to study collaborations was a reflection of the practical realities of working in the infectious disease arena. Most infectious disease work, be it in research or practice, is still organized around individual pathogens. Choosing specific diseases to focus upon, helped me communicate my aims better to policy practitioners. In addition, other scholars have demonstrated the importance of framings of disease narratives in mobilising attention and policy response (Leach and Scoones, 2013). Choosing disease-based case studies, therefore allowed me to maximise the variability of disease framings and examine its role in shaping intersectoral collaborations.

My analytical framework, introduced in chapter (see Figure 3) identified disease framings as a possibly key factor influencing collaborative outcomes, I chose exemplar diseases that could maxmise the variation wihin my cases to increase its explanatory power. I chose two diseases in each state: one that would be outbreak prone, potentially causing (or increasing risks for) mortality among humans and/or animals; and another that would be a more diffused endemic/enzootic disease, which would be widespread but relatively less talked about. As described in Table 5 below, I chose Leptospirosis and Anthrax as

illustrative examples of diseases that resulted in visible deaths in humans and animals, respectively in Gujarat and Tamil Nadu. Brucellosis was the example of widely prevalent but less discussed zoonosis, and was common across both the states.

Table 5: Characteristics & study sites of disease cases

Zoonosis & Framing	Study site	Species affected	Presentation	Route of transmission
Anthrax Outbreak-prone	Tamil Nadu	Livestock, Humans & Wildlife	Sudden death among animals; variable	Contaminated blood; Dust-borne spores
Leptospirosis Outbreak-prone	Gujarat	Humans; Livestock; Rodents	Fever with respiratory / renal distress	Water contaminated with rat urine
Brucellosis Enzootic/Endemic	Gujarat & Tamil Nadu	Cattle; Buffalo, Sheep; Goat; Pigs, and Humans	Low grade fever; Abortion in animals	From infected animals

As I describe in subsequent chapters, all three diseases had unique as well as overlapping charactersitics. Anthrax and leptopsirosis typically manifested as outbreaks and both carried risks of fatal infections among humans. Therefore, reports of both these diseases eliicted strong response from the agencies. The difference among them was that while anthrax was usually first noticed because of deaths among animals with characteristic bleeding symptoms, leptospirosis was usually noticed among humans, generally in the rainy seasons.

Brucellosis, which was the common disease across both states, affected similar species as anthrax. However, apart from causing self-limiting abortions in livestock, it was difficult to spot, either in animals or humans, unless tested.

Thus, to sumarise, I based my study in two states, which shared certain economic and administrative characteristics (resources, bureaucratic capacities) but differed on others (social priorities, political culture). Within both states, I selected two diseases that could allow me to assess within-case variation (in disease characteristics and response), while at the same time allow comparisons between both the study states as well.

3.4 SCOPE OF STUDY

Whereas the preceding sections describe what the study is about, given the multiple topical and disciplinary areas covered, I feel it is also important to identify areas that were not a priority for this study. First, this study was not meant to be an evaluation of existing multisector interventions around zoonoses in India. Rather, it aimed to identify the social, cultural, political and disease conditions that might influence or restrict the occurrence of multisectoral collaborations around zoonoses prevention and control in India.

Secondly, as mentioned before and unlike much of infectious disease research, the focus of my research was not on the diseases themselves, but on collaborative practices (or their absence) that developed around zoonoses.

Lastly, the study is focussed on the state level practices around collaboration, and included perspectives from global and national-level actors only to provide the larger context within which state agencies operated in.

3.5 DATA COLLECTION STRATEGY AND METHODS

I organized my fieldwork across three different trips to India lasting a total of nine months over a fifteen month period between January 2015 and March 2016. During this time I conducted 99 interviews, attended numerous meetings and participated in field visits with outbreak response teams. My fieldwork took me to Ahmedabad, Bangalore, Chennai, Gandhinagar, Delhi, Hosur and Vellore (Refer to Appendix D for details).

There were several reasons why I did not opt for a continuous stretch of fieldwork. First, it allowed me to space out my data collection over a larger period, covering multiple disease seasons, thus increasing the chances of witnessing an actual disease outbreak and its response. Additionally, persistent observation is said to help in developing familiarity and trust with the study participants, yielding better data. The idea being, "more will be revealed, and therefore, the data will be more valid" (Morse, 2015, p. 1214). Lastly, I held repeat interviews with a quarter of my informants in different field visits. Punctuating my fieldwork with brief periods of debriefing and reflection in the UK helped me refine my data collection strategy. Having focussed on factual questions in early fieldwork, I could move on to ask more probing questions investigating the mechanics as well as politics of decision-making in my later interviews.

Given the fact that my research was aimed at gathering different kinds of information about diverse sectors and geographies, I had to cast a wide net for collecting information. While my principal modes of inquiry were key informant interviews, participant observations and literature reviews, I deployed other information sources and techniques for data collection, as described below and in Figure 4.

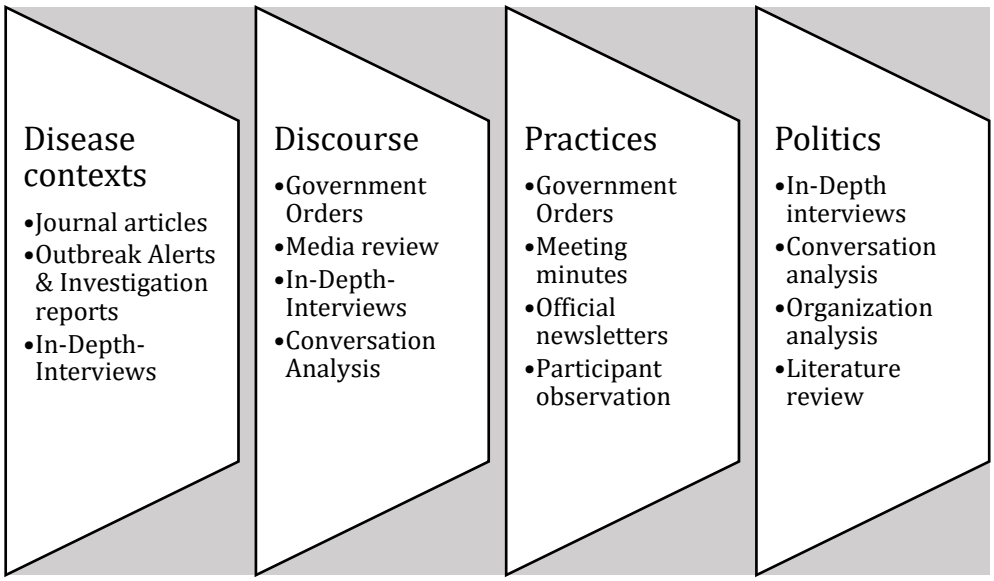


Figure 4: Information sources

Outbreak alerts and outbreak investigation reports, where available, proved invaluable in identifying distribution of specific diseases and the communities affected by them. While the official website of the national disease surveillance programme does provide a weekly list of reported outbreaks, the informal collaborative platform, ProMED mail proved to be a much more informative and exhaustive source of suspect and confirmed disease outbreaks[8].

The government documents proved helpful in other ways. During the course of my PhD, I learnt from serving bureaucrats how to peruse annual reports, official statistics, meeting minutes and project files – not only to find what was written in them, but also to deduce from the information not mentioned explicitly. This proved quite helpful in deciphering institutional priorities and differing perspectives of authoring agencies.

I found news media to be another source of information and insight, both for spotting specific disease events (such as an anthrax outbreak, not listed in government reports) as well as in helping decode priorities of political regimes. Examining organizational charts and profile of key officers proved very useful understanding power dynamics in interest groups within government departments.

However, by far the most important source of information for my research proved to come from the in-depth interviews as well as informal conversations I had had with 74 individuals in different parts of India, all of whom had privileged access to some aspects of

[8] See http://idsp.nic.in/ and http://www.promedmail.org/soas

policy formulation or implementation around zoonotic diseases. Please refer to Appendix D for an anonymised list of all interviewees.

The 'studying up' of elites and experts has traditionally posed a challenge for researchers adopting an ethnographic stance in office settings "*where ethnographic access is by permission of people with careers at stake, where loitering strangers with notebooks are rarely welcome, and where potential informants are too busy to chat*" (Gusterson, 1997, p. 116). However, some other researchers, on the other hand, have problematized the term 'elites' and pointed towards the "*instabilities and uncertainties of power within the research interviewee/interviewer relationship*" that might exist even in such settings (Neal and McLaughlin, 2009, p. 689).

Recent publications have taken the discussion even further and argued that it might be better to rethink power within interview spaces and develop a more collaborative approach to the study 'subjects'(Smith, 2006). This explains the reason I refer to my interviewees as informants rather than respondents in the dissertation (Morse, 1991).

Many researchers have highlighted the importance of and strategies to negotiate access to highly placed officers in policy research (Goldstein, 2002; Harvey, 2011). I must say my experience of negotiating access to and participation of many of my key informants was less difficult than that described by Gusterson (1997). Some of my informants had known me for more than five years through my work as a public health researcher. My previous work in zoonoses, coupled with the fact that I was still affiliated to an Indian organization, possibly helped open doors more easily than if I were not known to them. I recognised that this could introduce a bias in my data and used several strategies to minimise its effect on my sampling and analysis, as described later in the chapter.

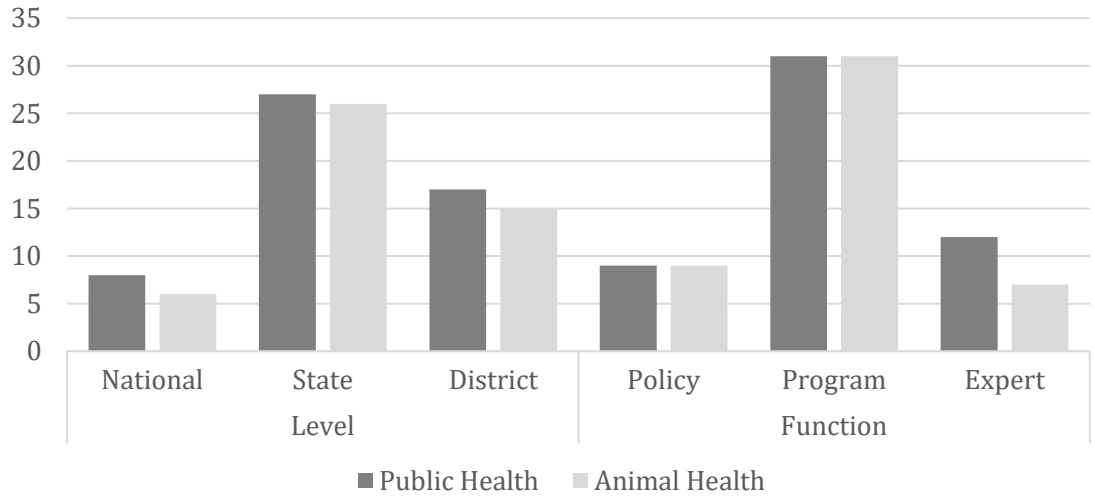


Figure 5: Distribution of interview informants, by sector, level and role

However, there were still instances where I was refused interviews[9], or was not able to schedule interviews because of unavailability of officers. Most of the people I sought to interview were gracious enough to be schedule telephone calls when not possible to meet in person.

In summary, I conducted 99 interviews with 74 individuals. As demonstrated in Figure 5 (also listed in appendix B), there was an almost equal mix of informants from animal and human health sectors. Most of my interviews came from programme managers (mostly technical officers) working at the state level and served to inform me about decision-making processes. I visited 1-2 districts in each state following tracing the everyday practices associated with specific zoonotic diseases. These comprise around a third of my interviews.

Table 6: Key meetings attended in the field

Meeting	Organizer, Date, Location	Discussion theme	Audience
South Asia One Health Workshop	• Ecohealth Alliance • May, 2014, Nepal	South Asia One Health Regional Collaboration	• Epidemiologists • Surveillance specialists
Rabies epidemiology in India	• Public Health Foundation of India • January 2015, Delhi	• Rabies literature	• Researchers
State Epidemic Coordination Committee meeting	• Government of Tamil Nadu • August 2015, Chennai	• Development of State One Health Unit	• Programme officers from Public Health & animal Husbandry departments • Local experts
Stakeholder perspectives on rabies in Tamil Nadu	• Public Health Foundation of India • September 2015, Delhi	• Rabies economic evaluation • Rabies policy gaps	• Researchers • Tamil Nadu program managers • National experts
Chatham House One Health Colloquium	• Chatham House • June 2016, London	• Developing One Health regional Centres of Excellence	• International agencies • National policy-elites

I supplemented my interviews with observations of everyday practices. This was through attending selected meetings, expert consultations as well as observing practices in the field. One of the meetings I attended was when the chief bureaucrats of animal and human health departments in Tamil Nadu discussed the establishment of a formal State One Health Unit, something I was able to follow up on in my subsequent visit (see chapter 4). I attended two technical workshops on rabies policy organized for a parallel research study that also involved some officers from Tamil Nadu. In addition, I attended a stakeholder

[9] Most dramatically in Surat, Gujarat; see chapter 6 on Leptospirosis.

consultation to develop a South Asia regional One Health collaboration that was useful in engaging with national and international actors active in the One Health circles (see Table 6).

In addition, I shadowed a rapid response team as it went about investigating and developing a response to an outbreak of anthrax in Tamil Nadu and village level dairy cooperatives in Gujarat to understand the supply chain mechanisms and working conditions for the veterinarians.

3.6 REFLECTION AND ANALYSIS

While designing and conducting this research, I was conscious of several potential sources of weakness that I had to guard against. These largely stemmed from the fact that my research sought to collate insights representing different perspectives from individuals in position of power. Some of these potential sources of weakness are common to other qualitative research studies and were amenable to standard approaches for improving validity, such as prolonged engagement; theory-driven inquiry; attention to emerging meanings and categorisations from members/research participants, and, finally, reflection on the interactional and textual research practices (Emerson, 1987). Other sources of weaknesses were more specific to my research setting and required me to exercise my judgment and reflection. These are elaborated below.

Multiplicity of perspectives

While devising strategies to promote rigour in qualitative inquiry, Morse (2018, p. 810) warns against using a template-based approach. Instead, she emphasizes that a single interview might yield both hard, descriptive, data, as well as 'softer' interpretive data. Assuring the reliability or trustworthiness of an analysis for both might require a difference in approaches (Morse, 2015). Recognizing that similar sets of facts can be interpreted in multiple ways (Roe, 1994), I attempted to use triangulation for ascertaining factual accuracy of descriptive information, while allowing more space for multiple voices to emerge. Indeed, Roth and Mehta (2002) demonstrate the possibility and advantages of combining positivist and interpretivist approaches precisely for the analysis of contested events.

According to Miles and Huberman (1994, p. 266) "*triangulation is supposed to support a finding by showing that independent measures of it agree with it, or at least, do not contradict it*". Factual information, such as the dates of an outbreak, or the agenda for a

meeting, were easily confirmed from news websites or from accounts provided by other informants.

Other points of view and insights, however, can be difficult to confirm, such as when an officer ascribed the development of formal collaborations as resulting from an experience of working together. In this case, I had to ascertain others' opinions as well as my own understandings of the One Health discussions in the state to be able to deduce the likely explanations. While distinguishing qualitative research from journalistic accounts, one of the points Morse (2018, p. 806) makes is that in research, not all facts are treated equally and need factual verification. It might be more important to take some things at face value, make effort to understand the motivations behind a statement, rather than verifying its facts. Regardless of the extent of influence the outbreak response played on developing a One Health unit in Tamil Nadu, the fact that a key actor cited this experience would have made it an important factor while analysing the development of multisector collaborations in the state.[10]

Lastly, Flick (2014) describes how triangulation can take place at different levels and forms. One way to account for the multiplicity of perspectives is by incorporating it in the sampling frame. As shown in Figure 5, I tried to ensure a diverse set of views by consciously sampling informants from both sectors, working at different administrative levels and having different roles.

Positionality

As I mentioned in chapter 1, and also described above, several people I interviewed as informants knew of me before through my earlier work on promoting multisector dialogue around zoonoses prevention and control in India. I had to think about my simultaneous identities as an insider – a doctor and public health researcher who had participated in policy discussions around One Health and rabies in Tamil Nadu and at national level previously - and an outsider, who obviously did not speak Gujarati/Tamil[11], or work within the public sector. These factors inevitably played out in my interactions in the field.

A potential source for introducing bias – my previous series of engagements with zoonoses actors in India – could also simultaneously help me increase the quality of my inquiry and interpretation. The virtue of having interacted with many of my respondents several times in the six years before my PhD, meant I could claim to have some

[10] Refer to chapter 4 for more details

[11] All interviews were conducted in English, which all my participants were comfortable in

understanding of the practical contexts of zoonoses decision-making which at times helped me understand the reasons for the stands taken by my respondents. However, recognizing that relying too much on my own framings could prevent me from seeking alternative explanations, I scheduled repeat interviews with about a quarter of my respondents. These were typically, the officers charged with surveillance and response to zoonotic diseases in the animal and the human health sectors.

I made it a point to meet these key officers at least twice in each of my three field visits – once at the beginning and once at the end. This allowed the officers to satisfy themselves about the purpose of my visit and allowed me to gain one level of validation for my findings. More importantly, during my last visit, when I realised that I had clearly run out of questions to ask these officers, and they had run out things to talk about with me, I began to keep my recorder off. This allowed me to engage with my interviewees in insightful conversations where they shared some of their insights and frustrations. This is where I got several important leads regarding bureaucratic cultures, and politics of decision making that informed my final analysis.

Scheduling repeat meetings in a span of fifteen months and by conducting open-ended interviews, I hoped would allow them to explain their positions with more nuance and prevent me from assuming simplistic explanations for their decisions. In fact, most of my respondents did not appear to hold back from expressing their frustrations, while simultaneously acknowledging the impacts of their work.

Seale (2002, p. 97) promotes a 'craft skill' conception of research practice, which suggests that researchers can develop 'methodological awareness', or "*capacity to anticipate the consequences of methodological decisions while carrying out a research project*" as an important dimension of research quality, one, that is independent of prevailing 'paradigms' or 'schools'.

Accordingly, in addition to having open-ended interviews, I tried to improve the quality of my analysis by recording memos, as described below, triangulating with other respondents, whenever possible, and, through the periodic debriefings with my supervisors in between my field trips. Some other measures I employed for organising my databases, and adopting reflexive analytical processes, are explained below.

Organising, coding and interpreting data

Developing a rich database is one of the ways of improving validity of qualitative research (Finlay, 2002; Morse, 2015). The dataset from my fieldwork comprised of audio

recordings of all my formal interviews. I outsourced transcription of all my recorded interviews to an external consultant, which I then cross-checked with the recordings.

I maintained a field diary during fieldwork that included a mix of meeting notes, observations in the field, as well as detailed reflections before and after each interview. Because of the way my interviews were organized, each interviewee represented a particular viewpoint: sector (animal, human), level of influence (national, state, district) and role (policy, program, research). In addition, most of the district level interviews, and those from certain technical institutions, related to a specific disease. I therefore developed a database of interview details, including the metadata related to each interview, and categorised theme along the themes of sector, level, city, organisation and disease, among others.

Having a broad analytical framework proved very useful in structuring my disease-based empirical case studies. I extensively referred to interview transcripts, notes and audio recordings corresponding to the disease I was examining, while developing initial drafts of disease-based empirical chapters. This exercise of repeated perusal of my database helped me identify key arguments, as well as relevant quotations, under each broad analytic theme. Drafting successive iterations of the chapters helped me spot the linkages between different analytical themes and identify core arguments.

Organising the database, sourcing quotations and developing my arguments was not a passive exercise, but required me to exercise a fair amount of judgment. As with most interpretative research, analysing elite interviews requires the researcher to ascertain the meanings used by the respondents in order for the researcher to construct their own definitions of reality (Magnusson and Marecek, 2015).

Spoken language often involves subtle contexts, and therefore interview transcripts, at best, can record segments of conversations, incomplete sentences devoid of allusions and non-verbal cues that mark normal conversations. To attach meanings to these snippets of conversations, I had to refer frequently to my field diary and call upon my own recollections. While this helped give a context to the conversation, this also required reflexivity and vigilance on my part to realise the subtle ways my interpretations (of the interviewee meanings) could affect the ultimate analysis (Mikecz, 2012; Saville Young, 2011).

Anonymization

Unlike conventional ethnographic research within local communities, researching elites involves a different set of power dynamics (Gusterson, 1997; Nader, 1972). All my

interviews with serving officers were conducted with full knowledge of their supervisors. Almost all the interviews I conducted, took place in the offices of my informants, excepting the few, which I conducted over the phone, or with individuals who had retired. Consequently, the authority vested in public office ensured that the power gradients were never seriously challenged, even when I asked probing questions and my interviewees would have felt comfortable telling me off or opting out, if they wished to do so.

However, interviewing people publicly, involving very specific areas of expertise and access, meant I could not promise absolute confidentiality to my informants. Given their levels of insight, even if I remove individual identifiers from their quotations, it might still be possible for 'those in the know' to identity my interviewees. I therefore committed to reconfirm with the informants before using their names with any of the quotes, while cautioning them that complete anonymization might not be possible even with the identifiers removed.

Ethics

My research underwent an ethical review process at University of Sussex, as well as the Institutional Ethics Committee at Public Health Foundation of India. The information sheets around my research mentioned contacts for ethical oversight of my research both in the UK as well as in India. I had undertaken to interview people with a high degree of responsibility and maturity with the implicit understanding that they would feel freer to opt out if they did not feel comfortable. I audio recorded all my consent agreements, where the interview was recorded.

I aimed to make it clear to my interviewees that, while the transcripts themselves will be anonymized and their names will be removed (as requested by the respondent in the consent form), other identifiers such as the perspective of the respondent, geographical location or his/her office are an important part of the analysis and might not allow complete anonymity to the respondent.

The research study also comprised a smaller component of informal interactions and conversations with subordinate staff working in peripheral settings, such as public health nurses or livestock extension officers. These visits to the districts were always preannounced and made with prior approvals of supervising officers. I did not interview any subordinate staff, apart from holding informal conversations. None of their names were recorded in the field notes and they have not been cited anywhere in my dissertation, thus ensuring their absolute confidentiality. In lieu of formal consent, I aimed to declare my identity as a researcher to everyone I came across in the field and shared an

information sheet about my study with them (Refer to Appendices C and D for copies of ethical approvals, consent and information documents).

3.7 CONCLUSIONS

In this chapter, I described and justified my choice of a comparative case study design with an ethnographic stance to answer my research question. I also explained the rationale for focussing on state-level policy discussions, focusing on selected zoonotic diseases across two different states to develop insights on how intersectoral collaborations occur and function around zoonoses in Indian context. I also reviewed the methodological challenges I encountered, including those emanating from my own positionality and the strategies I adopted to counter them.

While I explained my focus on state-level and disease-level collaborations, the next chapter will situate the subsequent disease-based case studies within the larger discourse around One Health and collaborations taking place at the global and national levels.

4 TRANSLATING ONE HEALTH RHETORIC IN INDIA

> *"In microbial terms, globalization is already a reality"* (Whitman, 2000, p. 4)

While I have described the beginnings of One Health and associated convergence movements in the preceding chapters, here I aim to analyse the framings around One Health more closely, including the practical translations at the national and state level.

By looking at examples from Gujarat and Tamil Nadu, I move from the wider international and national framings of One Health to how collaborations are enacted in practice, highlighting, the importance of factoring in informality and the politics of knowledge underlying complex intersectoral collaborations in zoonoses into my analysis.

As discussed in chapters 1 and 2, the term One Health is of recent origin, having been coined in the wake of global anxiety around emerging zoonotic diseases from the 'Manhattan Principles of One World, One Health' (Cook et al., 2004). Despite the 'many histories' of animal-human health collaborations (Woods and Bresalier, 2014), there is little consensus on the meaning, scope or functions of One Health (Chien, 2013). Its meanings are still contested, making it a fluid concept with multiple connotations (Bardosh, 2016; Bardosh et al., 2017; Zinsstag et al., 2015). While some place its remit solely around zoonotic and emerging infectious diseases and argue about the place of other species (MacGregor and Waldman, 2017; Rock, 2017), others want to see the concept of One Health being applied to other domains, such as non-communicable diseases (NCDs) (Turner, 2015) and plant health (Boa et al., 2015), among others.

Given the fact that the affairs of each sector (animal health, human health, environment) or commodity (cattle, poultry, cereals, wildlife) are governed through their own respective intellectual disciplines and administrative bureaucracies, there are immense political interests at play depending upon how One Health is defined, and consequently how the involved stakeholders get selected to deliver on the vision.

Scholars of discursive policy analysis recognise that "language profoundly shapes one's view of the world and reality, instead of being only a neutral medium mirroring it" (Hajer and Versteeg, 2005, pp. 176–7). Citing Foucault's approach to intertwining of knowledge and power, discursive analysis recognises how the manufacture and representation of narratives by different actors become an exercise of their political power (Hajer and Versteeg, 2005; Wagenaar and Cook, 2003).

Within the context of emerging infections, Leach, Scoones and Stirling (2010a) describe how the problem of EIDs has been framed in the form of different narratives. These

narratives compete for attention and appeal to various policy actors, using different measures depending on how closely the narratives align with their respective worldviews (Chien, 2013). One of the dominant framings of zoonoses has been an understanding of disease emergence as a biological phenomenon, and as a potential threat to global health security (Elbe, 2011; Leach and Hewlett, 2010).[12]

To be sure, there are competing narratives that challenge the purely biological and threat-based conceptualisation of zoonotic diseases and emphasise studying disease emergence from social and ecological lenses as well. While social science scholarship (Dzingirai et al., 2017b; Hinchliffe, 2015; Wallace et al., 2015; Wilkinson and Leach, 2015) has been at the vanguard of challenging these framings, scholars from other disciplines has questioned the simplistic construct as well. Those who have questioned the purely-biological framing of disease emergence and spread include biologists such as Bogich *et al*. (2012) and Daszak *et al*. (2013) who argue for the importance of factoring in systems thinking and interdisciplinary approaches, respectively. Others include epidemiologists who have highlighted the associations between poverty and zoonoses (Jones et al., 2013) and discuss the importance of engaging with communities for constructing disease understandings (Wood et al., 2012).

4.1 GLOBAL DISCUSSIONS AROUND ONE HEALTH: ACTORS

Despite the presence of alternative framings to a narrow biomedical conceptualisation of One Health, many researchers believe that social factors continue to be neglected while analysing disease epidemiology, as well as or in deliberating disease response at global and national levels (Bardosh, 2016; Cunningham et al., 2017; Dry, 2008; Galaz et al., 2016; Scoones and Forster, 2008).

One possible reason for the dominant nature of biomedical, threat-based framings of One Health, which have been likened by some as an example of "technocratic tyranny" (Waltner-Toews, 2017), could be the strong top-down nature of the discourse surrounding development of One Health. As most histories of One Health discussions demonstrate, the development of the One Health movement was marked by the participation of multilateral and international agencies who themselves could not agree on the operational definition of One Health (Cassidy, 2016; Chien, 2013; Leboeuf, 2011). In her analysis of the development of the One Health movement among international institutions, Leboeuf

[12] One example of such threat-based framing of zoonoses could be the article by Karesh and Cook (2005) in *Foreign Affairs* highlighting the 'worrisome' diseases crossing species and national barriers, or the one by Wolfe *et al.* (2007)which describes disease emergence as a purely biological phenomenon.

(2011) categorises the key institutional actors in five concentric circles. In her conceptualisation, the Food and Agriculture Organization (FAO), World Organization for Animal Health (OIE) and World Health Organization (WHO) constituted the primary vehicles for the propogation of One Health. Funding agencies, other multilateral agencies and research and activist commuities comprised the peripheries in this conceptualisation. But this is not how the global governance of One Health turned out to be (Cassidy, 2018; Lee and Brumme, 2012).

The term One Health originated from the 'One World, One Health' concept, which was trademarked by the Wildlife Conservation Society (WCS) (Trademarkia, 2018). Possibly, in an attempt to remove the movement from ownership of the WCS, the tripartite of FAO, WHO and OIE promoted the term, 'One Health' in a series of international meetings; specifically the international Ministerial Conferences on Avian and Pandemic Influenza (IMCAPI). The term One Health was officially adopted in the Delhi Declaration of IMCAPI in 2007 (Chawdhry, 2007) and developed into a concept note for multi-agency collaboration in 2010 Hanoi IMCAPI (FAO et al., 2010).

However, despite the idealised intentions to work together, the international agencies, which are notorious for their bureaucratic cultures (Weiss, 2016), were still struggling to develop a working definition of One Health and discussing how best to operationalise One Health several years down the line (Khabbaz, 2010).

The disconnect between the expectations of the global One Health movement and local practices at country level have been documented in multiple country studies, such as those by Bardosh (2014), Okello (2014) and Smith (2014) with their colleagues. Given the top-down nature of the One Health movement, it is not surprising that the difficulties faced by key sponsors of One Health found echoes at the country level too.

Animal, environment and human health are generally housed in different ministries and their knowledge grounded in different disciplines. These bureaucratic and disciplinary silos, when combined with varying levels of motivation around One Health, offer real resistance to the integration envisaged by One Health (Jerolmack, 2013; Schmidt, 2009). This is possibly why there have been so few demonstrable examples of country level One Health collaborations, a major criticism of One Health approach (Chien, 2013; Gibbs, 2014; Lee and Brumme, 2012).

Recent reviews of literature have highlighted the growing popularity of One Health. Galaz *et al*. (2015) and Valeix (2014) demonstrate, using bibliometric analysis, that many more papers and researchers have started referring to One Health over the last decade.

However, this increased popularity of the term among researchers hides the dominance of researchers and institutions residing in the Global North, and those advocating a top-down surveillance-oriented approach (Galaz et al., 2015; Valeix, 2014).

Despite the above-mentioned limitations, it is clear that One Health still enjoys sufficient popularity to be able to sustain a One Health community. A One Health platform has been launched that has organised two more iterations of the International One Health Congress and brought out a newly launched One Health journal. There has been some alignment in the parallel eco-health and One Health movements, with both groups organising a joint conference in 2016.[13]

The west African Ebola outbreak of 2014 (Wilkinson and Leach, 2015), and the high visibility of anti-microbial resistance (Chioro et al., 2015), have resulted in a large number of research groups working on the issue of zoonoses and emerging infections, many of them citing a One Health approach.

The multilateral agencies are deepening their collaborations — a recent output being a 'bridge tool' that combines elements from WHO's IHR[14] checklist and OIE's PVS[15] assessment tools to develop a framework for assessing country capacities for One Health collaborations (WHO et al., 2014). However, as explained above, it is not clear how much of the current discourse around One Health is reflective of the holistic 'one world' thinking and how much is predicated on the 'research buzz' around the concept (Galaz et al., 2015; Leboeuf, 2011).

The disconnect between global rhetoric and local realities has been highlighted in other country contexts (Okello et al., 2014). The next section describes the interpretations of global discussions on One Health in India and its influence upon local policies.

4.2 ONE HEALTH IN INDIA: INSTITUTIONAL LANDSCAPE

Before we can discuss the local interpretations of One Health discussions in India, it will be useful to clarify the institutional landscape around zoonoses in the country.

As described in chapter 2, within the Indian federal administrative system, animal, environment and human health sectors are the responsibility of the sub-national state governments. However, with a few exceptions, a substantial portion of the technical expertise in the disciplines is housed within the central government funded Institutions.

[13] https://onehealthplatform.com/
[14] International Health Regulations, at http://www.who.int/ihr/en/
[15] Performance of Veterinary Services, at http://www.oie.int/solidarity/pvs-evaluations/

In keeping with the size and diversity of the country, there are many institutions that work on some aspects of zoonotic diseases in the country. However, there are three major players as far as networks and policy visibility is concerned. These are the National Centre for Disease Control (NCDC), the Indian Council of Medical Research (ICMR) and the Indian Council of Agricultural Research (ICAR). The NCDC and ICMR are both health sector institutions, playing a role analogous to the US CDC (CDC) and the National Institutes of Health (NIH), respectively. The third institution, ICAR, belongs to the agriculture ministry and has a different role to play, as described below.

First, the NCDC is officially a technical arm of the Ministry of Health and Family Welfare. It houses the national disease surveillance programme and is supposed to provide technical guidance and support to state governments in case of any health emergency. In addition, the NCDC also houses the National Standing Committee of Zoonoses that convenes multi-departmental meetings on zoonotic diseases on a regular basis, as well as runs the national referral laboratories for rabies, brucella and leptospirosis, among others. As highlighted in the discussions with officers in these agencies, at times NCDC officials blur the boundaries between government bureaucrats tasked with implementing government mandates and technical experts who are also supposed to provide independent and considered advice to the key decision-makers.

The second health institution is the ICMR, now having the status of an autonomous department within the Health ministry. It has a network of 26 centres of excellence enjoying expertise in niche areas, such as leprosy, leptospirosis, virology, and statistics. The ICMR is among the largest funders of research in neglected tropical diseases globally (Moran et al., 2012). It funds original research through research grants to medical colleges and universities and also funding the work of its own laboratories. In another indication of the differences in their institutional mandates, while officers in NCDC are referred to as Directors, all technical professionals in ICMR are designated as scientists.

Scientific discussions around niche areas such as virology and vector-borne diseases have been dominated for more than 50 years by government-mandated centres of excellence, the National Institute of Virology (NIV) or the National Institute of Malaria Research (NIMR). Having half a century worth of intellectual leadership in an area brings in its wake notions of disciplinary ownership for many institutions. Enabled by technical expertise, decades of history, as well as an explicit government mandate, many central research institutions have developed a powerful influence in deciding how to interpret scientific evidence in their areas of disciplinary expertise.

The large number of government-funded institutions in health also means that the scientists from these institutions are frequently drawn upon either to provide expertise in government activities, such as outbreak investigations, or sometimes in running programmes on the behalf of the government itself, as seen in the case of the Integrated Disease Surveillance programme and NCDC. This means that scientists from national institutions are at times expected to tow the government line (as in the case of outbreaks) or are seen as extensions of central government's authority (such as when visiting states for meetings or outbreak investigations).

Both NCDC and ICMR lost face in the aftermath of the presumptive plague outbreak in Gujarat in 1994. As detailed by Garrett (Garrett, 2000) and Deodhar (1998), the outbreak resulted in huge economic losses and mass anxiety, but was based on laboratory tests of questionable specificity and quality performed by NCDC. The government of the day had to commission a special series of studies by then ICMR Director General V. Ramalingaswami (Ramalingaswami, 1996, 1995) to prove the presence of disease. I recount some additional examples of the functioning of NCDC in outbreak control and guideline development in chapters 5 and 6, and discuss the implications on public health response for zoonoses in India in the chapter 8.

In a situation where institutional collaborations are difficult to develop, having cross-sector institutional collaborations with the veterinary sector is even more complicated, given the fact that the Animal Husbandry Department is housed in Ministry of Agriculture, with resulting power dynamics between ministries and departments.

Almost all research and teaching institutions in veterinary sciences are governed by ICAR—the third key actor involved in zoonoses discourse in India. ICAR is a huge entity. It manages a network of more than a hundred specialised research institutions and manages the accreditation of all agriculture and veterinary schools in the country.[16] Scientists from ICAR can be deputed to work in the Department of Animal Husbandry as technical advisers to the minister, and therefore many senior ICAR scientists are quite familiar with policy concerns of their sector.

Institutional capacity is different for the wildlife sector, the third sector commonly ascribed to One Health (Coker et al., 2011). Wildlife health comes under the Ministry of Environment, Forest and Climate Change in India. However, it has a much smaller presence in health discussions as opposed to the health and veterinary sectors. As depicted in Figure 6 above, a simple comparison of research output published from India

[16]Refer to http://www.icar.org.in/node/119 for details.

on 'public health', veterinary public health' and 'wildlife health' on PubMed shows a vast majority of publications mentioning public health. The share of veterinary and wildlife to total health publications were so low so as to be almost invisible in the graph below (2.2% and 0.2%, respectively).[17]

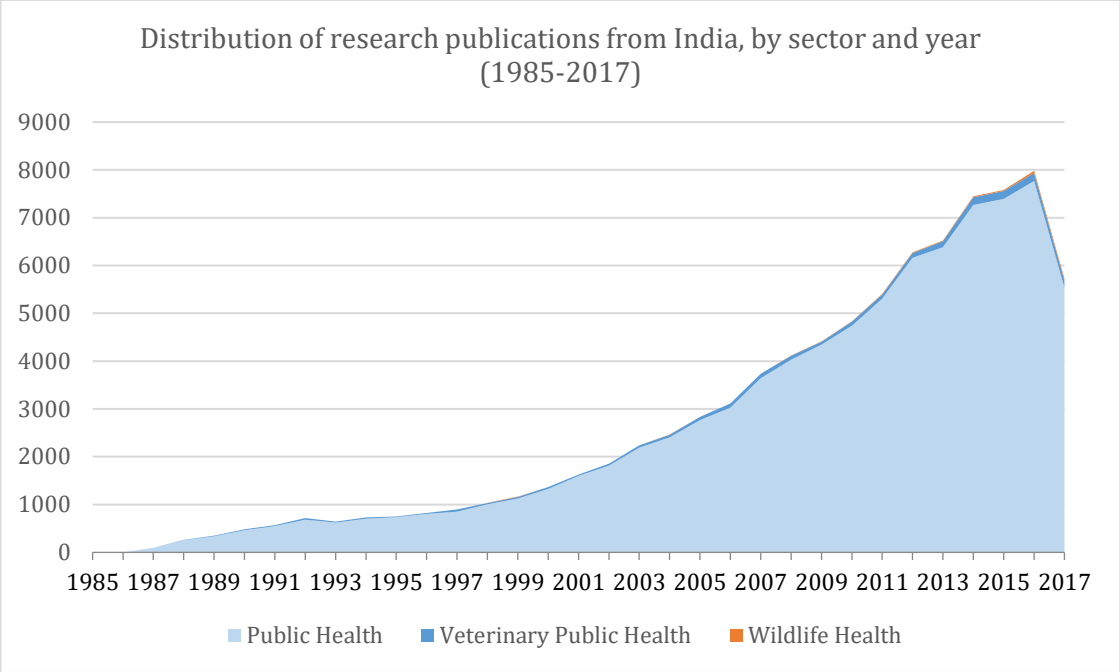


Figure 6: Research output from Indian institutions, by sector
As indexed in PubMed (1985-2017)

Wildlife agencies can be involved in diseases specifically affecting wildlife, such as anthrax, avian influenza, Kyasanur Forest Disease (KFD) and West Nile virus. However, apart from a small number of institutions, most laboratory and veterinary expertise generally come from a veterinary agency.

4.3 One Health in India: policy realities

> *The actual One Health (approach) that the world is following, or we can say, intends to follow, we too intend to follow. We can say that. But it will take some time - as it's not that easy. There are so many different departments, which were working in different fields for such long time, so to make them come together (will be difficult). (A11, 22 March 2016)*

The earlier sections described the fluid nature of One Health discourse that has resulted in multiple framings of the approach. As explained below, in some ways the key elements of One Health discourse are reflected at national level in India as well. On the other hand,

[17] Keywords used for Pubmed search were as follows: (public health) AND India[Affiliation]; (veterinary public health) AND India[Affiliation]; and, (wildlife health) AND India[Affiliation].

there are some aspects to the global discourse around One Health that simply fail to match with local needs. The institutions involved in zoonoses-related activities in India chose to make their own interpretations of the global discussions and tailored these to meet local requirements within the parameters of the local institutions.

A key point of departure between international discourse and local discussions was on the way policy issues concerning diseases were prioritised. The focus of major international institutions was almost overwhelmingly on exotic (to the Global North), pandemic-prone and emerging infections, as exemplified by avian influenza, one of the three "entry points" identified by the FAO/OIE/WHO tripartite (2010).[18]

On the other hand, an Indian priority setting exercise, of which I was a part, demonstrated how national stakeholders prioritised endemic/enzootic infections such as rabies, leptospirosis, brucellosis and anthrax, mentioning pandemic-prone influenza and emerging viruses much lower down (Sekar et al., 2011). This finding was echoed in other priority setting exercises set in different institutions, such as the NCDC (NICD, 2005), WHO (Gongal et al., 2009) and veterinary community (Kurian et al., 2014).

In addition to the disconnect between international and national policy communities, the priority setting exercise for zoonoses in India also helped expose the disconnect that existed within the traditional academic community and felt needs from decision-makers. A follow-up study from our group in India compared the research priorities with actual research outputs and found them to be in contrast to each other. A section of decision-makers felt the need for research focussing on social, political and economic factors around zoonoses. In contrast, when the actual research output of an exemplar zoonosis, rabies, was analysed, it was found that most research was conducted around biological factors that did not have an immediate bearing on the information needs of decision-makers (Abbas and Kakkar, 2015; Kakkar et al., 2012).

This disconnect between policy expectations and research output is not unique to zoonoses in India. Indeed, similar arguments were made in an analysis around the politics of zoonoses-related knowledge generation at the international level as well (Bardosh et al., 2017). There could be multiple explanations for such a disconnect, including system architecture and individual incentives linked to the lack of intersectoral collaboration. An important factor in the Indian subcontinent is likely to do with the pedagogy of One Health. A survey among medical students found very low levels of awareness as applied to

[18]The third 'entry point' for establishing One Health collaborations was identified as rabies, which did resonate locally.

their curriculum. In contrast to medical training, zoonoses occupy an important role in the veterinary curriculum. However, for all its strengths around zoonoses, there are strong limitations to the way veterinary public health is taught in Indian veterinary schools (Kakkar et al., 2013).

As I discuss later in chapter 7, within the veterinary sector, there is little to distinguish microbiology with public health apart from the selection of pathogens. There is very little epidemiology that is taught within most veterinary schools, the result being the focus in VPH, similar to microbiologists in human health sector, is more on absolute positives, rather than analysis of population level trends (Field notes, B6, 25 Feb 2015).

There is limited exposure to applied epidemiological competencies in both curricula and no time is given to cross-sector learning. No wonder that for most medical and veterinary professionals, the disciplinary silos inculcated during their graduate training persist for their entire professional lives.

With regards to formal animal-human health collaboration platforms, there are no formal One Health programmes operational at the national level. The closest the government came to launching a jointly-funded One Health programme was when a national pilot programme on rabies control was proposed jointly by NCDC and the Animal Welfare Board of India in the 12th Five Year plan (Planning Commission of India, 2011). However, this also failed to secure funding and had to be abandoned. The one area where a One Health approach has been internalised across different government agencies relates to avian influenza.

Public health agencies in India had been involved in developing pandemic preparedness plans from the first iteration of the document circulated by the CDC in 2004 even before the templates were eventually developed by the WHO. As one of my respondents, a former epidemiologist with the ministry, recalled:

> *I think I first saw a pandemic preparedness plan in late 2004. That was the immediate response of US CDC following the China episode (of avian influenza). Then it was a lake in northern China - there were a lot of bald headed geese, and hundreds were dead. That started the alert. And in response to that, US CDC made a plan. That plan came to the minister who was Anbumani Ramadoss at that time. I remember there were 30 PDF files and all those things. And, incidentally, the person who led this operation from US later became the Ambassador to India, Nancy Powell.*
>
> *So, this document came and any proceedings over avian flu and their preparedness and pandemic...all those words came much later. But this process started the thing. And I clearly remember when I first wrote a comment on that. Using my common sense, I would not say public health sense, probably I was not trained enough till that time. So I said that we can*

> *support them in supplies, we can support them with personnel...and also whenever this thing happens anywhere in the world, we can have a team prepared.*
>
> *DDGP (Deputy Director General Programmes) was laughing at me. Do you think they need people from my country? Or, supplies from my country? Nothing like that.*
>
> *So, that was my first episode of these things. After that in 2005, WHO adopted it. Remember, this happened before WHO came. So, the direct preference and all things were all removed. It was like a more broad and general document. And then they started looking into like where to say pandemics, phase I, phase II, phase III, all these. So they started basically looking at it and they took about a year I would say to come out with something very concrete. Till the end of 2005, the WHO documents were also not ready. There were some conflicts between documents. That became clear mainly after the Thailand outbreak.*
>
> *But China had huge outbreaks. So that is the time they started setting things in order and I was again roped in, this time by DG, not by DDGP and asked to prepare a document for pandemic preparedness for India.*
>
> *And I was told that 2 people would be working with me. Both of them very, very senior to me – one from programme side and one from lab side.*
>
> *So I went to the ministry, met the program person. He told me, "*This isn't the way to prepare a document. We'll take the Canada pandemic preparedness programme and Indianise it*." So I started doing that.*
>
> *So that was the first document that was made and for quite some time it was known as my document. But that is the first printed document that went into the website of MoH. No template had come from WHO for preparing it at that time.* (A4, 23 Feb 2015)

The economic implications of the disease, coupled with high-level political mobilisation as a result of IMCAPI meetings put avian influenza high up on the policy radar. The template-based structure of the pandemic preparedness plans and the related guidelines proved to be big success with the bureaucracy. The clear allocation of responsibility across health and animal husbandry departments provided a framework for communication at different levels.

The formal task force and joint monitoring groups constituted for the purpose of responding to suspect avian influenza outbreaks (see Table 7 below) helped establish a protocol for communication within the framework of existing bureaucratic hierarchies.

I found evidence that at least on one occasion, it was due to the communication enabled by an avian influenza meeting that the discussions around a broader One Health

collaboration were initiated in one state.[19] The kernel of this bureaucratically mandated formal collaboration also helped develop coordination, as recalled by a veterinary officer in the central Department of Animal Husbandry:

> *Specifically if you talk about avian flu, we are having very good co-ordination with Ministry of Health; Ministry of Environment & Forest. And every month, almost every month, they are having meeting under DGHS – the Director General of Health Services and we are a member. As far as co-ordination is concerned, avian influenza, by default, has been a boon to initiate the co-ordination between the two sectors.*
>
> *And slowly, slowly, because of that co-ordination has been started for other diseases also because we know each other now.* (A1, 4 Feb 2015).

Table 7: Institutional mechanisms for coordination at national level
Adapted from *(Kakkar and Abbas, 2011)*

Coordination mechanism	Convenor	Membership	Function
Joint Task Force on Pandemic Preparedness and Response	Secretary (Health)	Policy makers	Executive responsibility; In-charge of pandemic preparedness and response
Joint Monitoring Group on Pandemic Preparedness and Response	Director General Health Services	Programme managers Technical Officers	Technical supervision & monitoring; implementing arm of Joint Task Force
National Standing Committee on Zoonoses	Director General Health Services	Researchers Policy makers	Observatory function; only formal body that meets in the absence of disease outbreaks
ICMR-ICAR Research Collaboration on Zoonoses	Indian Council of Medical Research	Researchers	Joint funding mechanism for zoonoses research
Roadmap to Combat Zoonoses in India Initiative	Public Health Foundation of India	Researchers Policy makers Practitioners	Collaborative research and advocacy

In addition, one of my respondents informed me that following the declaration of the Ebola outbreak, the Joint Task Force on avian influenza would also be meeting to discuss other health emergencies (Respondent A3, WHO India, 05-Feb-15).

In addition to the formal collaborative bodies convened by the government, it is quite possible that informal networks would be the venues where qualitatively more ideas might be exchanged. A survey of think-tanks demonstrated how the provision of a neutral

[19] See discussions on the development of state's One Health unit in Tamil Nadu, in chapter 7, where a series of interactions between the Director Public Health and Veterinary epidemiologists led to brainstorming on establishing formal collaborative mechanisms.

platform outside formal spaces can open up discussions (Bennett et al., 2011). As mentioned in chapter 1, I was personally involved in the activities of Roadmap to Combat Zoonoses in India initiative, one of the informal networks mentioned above and feel that its activities helped push forward the discussion around One Health and intersectoral collaborations.

The RCZI initiative was established in 2008 in response to calls for increasing multisectoral collaborations around zoonoses in India. The RCZI was based at the autonomous, Public Health Foundation of India, where I worked at the time, and aimed to provide a space outside the formal sector to allow for more open discussions between major stakeholders and to raise the quality and content of zoonoses policy discussions in India.

Another informal network, which is likely to have played a major role in influencing One Health discussions in India, was a postgraduate course in One Health offered by Massey University to 249 professionals working on One Health related areas in South Asia. The course involved workshops and conducting joint research projects together. Its influence on strengthening One Health related research and capacity building has been described by McKenzie *et al*. (2016) and as testified to by a senior veterinarian in the Department of Animal Husbandry:

> *And because of that Massey program, we have been together for the master course—the medicos and the veterinarians. So, we have been able to develop personal relationships also and that is always helping* (A1, 4 Feb, 2015).

4.4 RHETORIC AND REALITY: GLOBAL VS NATIONAL

While of late there have been many critiques of the One Health approach, ranging from those viewing it as the latest iteration in a long history of animal-human collaboration initiatives (Woods and Bresalier, 2014) to those critiquing a narrow, high-income country focus underlying the One Health discourse (Galaz et al., 2015) to still others advocating for a more inclusive and socially-rooted understandings of diseases and interventions (Craddock and Hinchliffe, 2015; Cunningham et al., 2017).

However, in many ways, the earliest framings of One Health continue to inform the dominant narrative. These framings were typically structured around wildlife-origin infections (Karesh and Cook, 2005) from a global health security perspective (Elbe, 2011) and a predilection towards technological solutions for preventing disease emergence (Chatham House, 2010). Analysis of the scientific literature around One Health (Valeix et al., 2016) and attendances at One Health Congress (Valeix, 2017) demonstrates that the

One Health field continues to be overrepresented by small groups of scholars and institutions from the global North.

While One Health did allow a focussing frame for discussion related to disease emergence, zoonotic diseases, as well as around the need for a multisectoral approach, it can also be argued that the One Health discourse actually distracted attention from felt needs of national and sub-national level actors. To illustrate the point, while the FAO/OIE/WHO tripartite (2012, p. vi) identified zoonotic influenza, rabies and antimicrobial resistance as 'entry points' through which to initiate discussion around One Health, priority setting exercises in India and Africa demonstrated that the national actors prioritised endemic zoonoses more than they did exotic and emerging infections (Salyer et al., 2017, p. S60; Sekar et al., 2011).

Continuing in a similar vein, another level of disconnect exists between the global rhetoric of One Health and local needs of the countries that are supposed to 'operationalise' One Health (Khabbaz, 2010). In many of the key texts associated with the One Health movement, there seems to be uncritical acceptance of the benefits to the countries of adopting a One Health approach.

By the phrase 'operationalising One Health' these texts usually call for establishing formal intersectoral coordination mechanisms at country level with little regard to the actual requirements and challenges. Examples of such standardized approaches include a WHO SEARO-WPRO published guidelines on 'establishing collaboration between animal and human health sectors at the country level' or the WHO-OIE-FAO (2014) operational framework for improving governance.

Even when One Health 'operational frameworks', such as the recent publication by the World Bank and Ecohealth Alliance (2018, p. x), claim that "*there is no one-size-fits-all approach for One Health implementation*", they still end up putting health interests above all others, such as in the oxymoronic phrase "*The Need for Multi-Sectoral Public Health Systems*" (2018, p. 2) and offer an uncritical acceptance of the assumption that One Health is a public good, beneficial for all sectors, even if their concerns are not directly addressed.

This tendency to prioritise human health perspectives over others is not unique to One Health discourse, and was very clearly demonstrated in the WHO's strategy advocating the inclusion of 'Health in All Policies' (2013) following its work on Social Determinants of Health. There is an almost naïve expectation that other, possibly less-resourced, departments will listen to public health concerns and allocate their personnel without a clear sense of benefits that could accrue to them.

It is despite, or possibly precisely because of, such a blinkered approach to One Health, that its operationalisation continues to be discussed in international fora (CDC, 2011; Prince Mahidol Awards Conference, 2013; Public Health Foundation of India, 2013) by white haired men (Valeix, 2017) from the global North (Galaz et al., 2016), while its approach faces a variety of barriers at the international and national levels (Abbas and Kakkar, 2013; Lee and Brumme, 2012; Okello et al., 2014).

4.5 CONCEPTUALISING ONE HEALTH COLLABORATIONS AT STATE LEVEL

Despite the achievements of formal national-level collaborative mechanisms discussed earlier, such as those around pandemic response, or the informal alumni network developed by Massey, it is clear that these might not echo the ideals of formal, functional intersectoral collaborations as envisioned in the One Health literature.

However, as I have argued in the previous chapter, the autonomy of state governments, combined with the relatively simpler institutional politics, make these the ideal venue for development of innovative models for intersectoral collaborations around zoonoses prevention and control.

While the following chapters will discuss specific instances of disease-based collaborations in my study states of Gujarat and Tamil Nadu, I will use this section to describe the different ways in which both states tried developing animal-human health collaborations going beyond individual diseases.

Officers in both Gujarat and Tamil Nadu told me about having had a history of disease-based collaborations between the animal and human health sectors. It involved leptospirosis in Gujarat and rabies in Tamil Nadu, both going back at least 15-20 years. However, for the most part, there was no overarching collaborative platform for developing coordinated response to zoonoses and other issues of mutual interest to animal and human health agencies, apart from the generic emergency response committees that are convened to respond to different kinds of emergencies, such as for natural disasters or disease outbreaks. Of late, though, with the increasing prominence of zoonoses and increased popularity of One Health, governments in both the states had started thinking of developing more permanent collaborative mechanisms, as described below.

Celebrating One Health in Gujarat

On my first visit to Gujarat in February 2015, in the very first meeting I had, the then Director of Animal Husbandry, told me about a seminar on One Health just one month

earlier. It was organised by the department along with veterinarians in the state and was opened by the state chief minister, a source of obvious pride for him. He shared a compendium of 'articles on One Health' with me and assured me that they strongly believed in the concept of intersectoral collaborations.

I was quite excited by the idea of veterinary and public health officers conducting technical discussion among themselves with the encouragement of the political leadership. However, a perusal of the seminar compendium (Figure 7) afterwards proved sobering for me. It consisted of a compilation of articles from a recent issue of the OIE journal covering One Health. The single page introduction, possibly the only original content in the booklet, cited the importance of cross-sector collaboration without mentioning the state public health department. As far as I could tell, only one public health officer was invited to attend the meeting.

Figure 7: A compendium of articles on One Health, January 2015, Gujarat

Apart from the seminar hosted by the animal husbandry department, the officers told me there were ongoing instances of collaborations with human health agencies, mostly in response to suspected zoonoses disease outbreaks. Depending upon the seriousness of the crisis, and the level of interest in political leadership, the degree of intersectoral collaboration could range from information sharing to physical exchange of personnel or

resources. It is important to keep in mind that such high levels of interests cannot be sustained. But that does not mean that such intersectoral collaborations are not possible.

As seen in the case of leptospirosis in Gujarat (see quote below), the threat of upcoming outbreaks makes sure that a minimum level of communication and engagement is maintained between both the departments more than two decades after the initial outbreak.

> *Like in Chandipura virus, CCHF virus they have full involvement, and they are also taking anti-tick preventive measures...for the concerned disease. So we have good collaboration with them. And off and on we are meeting, around twice in a year or thrice in a year, and we have a collaboration with the agriculture department also, for leptospirosis, for anti-rodent activity.*
>
> *This is formal mechanism, whenever we call the meeting for this Chandipura virus, or CCHF or...leptospirosis, we have formed one committee, coordination committee, at the state-level and district-level. So we are calling them…. And this is regular process.*
>
> *Mostly health department leads it and others join, and, how to control and how to employ their staff and which type of insecticide or this...for the prevention purpose, discussions they do, and finally the implementation part, we implement, the government, this health department side, human side and they act on animal or agriculture side (E4, 12-Aug-15)*

In summary, efforts to develop 'One Health' collaborations in Gujarat generally seemed to be geared towards episodic events, and in response to specific requirements for collaboration. When discussions around collaborations did take place, as was the case of the One Health seminar, the efforts of the veterinarians seemed to be to justify their presence and scope of contributions towards such a collaboration, rather than any offer to lead.

Institutionalising collaborations in Tamil Nadu

While the state officers I met with in Tamil Nadu were as voluble and proud of their work on zoonoses as in Gujarat, the intersectoral collaborations I noticed in Tamil Nadu were qualitatively different from those observed in Gujarat. As mentioned in chapter 3, I have tracked intersectoral collaborations longer in Tamil Nadu than in any other state in India. The factors that initially drew me to Tamil Nadu are still ones that set it apart from most other states in India.

As also described in chapter 3, most states have intersectoral representative committees for overseeing surveillance, pandemic preparedness and response, among other functions. However, their activities seldom extended beyond these specified loci and mostly function in an *ad hoc* manner. We discovered in 2010 that Tamil Nadu had developed a formal intersectoral collaborations committee for facilitating communication and coordinating

response for rabies control in the state. The state government did not look at it as a 'One Health' innovation at the time, but its leading officers were happy to use our presentations hailing it in those terms (Abbas et al., 2011a; Kakkar et al., 2011a).

A further series of fortuitous circumstances resulted in the development of proposals for a more formal One Health unit to work at the state and district levels. The Director of Public Health, Dr Kolandiswamy, mentioned how his experience of working closely with veterinarians over a month-long period while responding to a suspect avian influenza outbreak in 2014 made him aware about the capacities of the veterinary sector and the overlapping of their respective mandates (Field notes, 18 July 2015).

Incidentally, the chief bureaucrats in the health and animal husbandry departments both had substantial experience of the other department as well. While the health secretary, Dr J Radhakrishana, was initially trained as a veterinarian, Mr Vijay Kumar, then heading the Animal Husbandry department, had previously had a stint as a Special Secretary in Health department. While veterinarians generally are known to be much more aware of zoonoses and the need for collaborations (Frank, 2008), I am sure the initiative must also have been helped by the fact that the key public health officers involved in the discussions had been trained in a two-year FETP programme at the Chennai-based National Institute of Epidemiology, and consequently been more aware about current discussions around EIDs, zoonoses and One Health.

The Health Secretary developed a keen interest in pursuing the idea of institutionalising a formal collaboration between both the departments. He accordingly convened a meeting on 13 August, 2015 to discuss the possibility of establishing a formal collaboration between both the departments. While I do not know its current status, an 'in-principle' approval of the body had been secured in 2016 and a draft Government Order prepared. The health department, ostensibly with access to more resources, was to house a One Health unit at the state level using funds earmarked for zoonoses control from existing surveillance programmes and led by a senior veterinary officer. A virtual unit to be led by a veterinarian deputed from the Department of Animal Husbandry was supposed to ensure collaborations at the district level (Field notes, 22 Feb, 2016 and documents from the office of Director Public Health) (Figure 8).

Figure 8: File for state epidemic coordination committee meeting

I felt the unit was a clever bureaucratic innovation on several accounts. By using in-service veterinarians instead of hiring relatively junior veterinary officers on a contractual basis (as was proposed in the national guidelines), the health department was able to secure the collaboration of staff with strong networks and practical experience of veterinary surveillance (B13, 25 June 2015). The Animal Husbandry department, in turn, got access to the resources of the health department and a chance to increase the profile of their contributions.

Even from the brief description above, several key differences in both the states' approaches to intersectoral collaboration start emerging. The instances of collaboration in Gujarat, be it the case of the One health seminar or the coordination committees mentioned in the quote, all seem to be geared to meet immediate needs and with no attempts at establishing something more ongoing.

The Tamil Nadu approach, in contrast, seeks to build upon pre-existing experiences of collaboration, around rabies, avian influenza and epidemic coordination, in order to build a longer-term collaborative platform. Apart from outbreak response, this could function in normal times, as well and benefit both departments through pooling of resources and more efficient use of existing sources of central government funding.

The Tamil Nadu experience differed from the Gujarat collaboration in another significant way. While the discussions in Chennai were led by the most senior officers of the departments of health and animal husbandry, meetings in Gujarat appear to have been convened by relatively junior technocrats.

The themes of formal versus informal collaborations and the contrasting politics of bureaucracies in different settings are relevant to the other case studies as well, as the subsequent chapters will show.

4.6 CONCLUSIONS

To summarise, I discuss in this chapter the overall discourse around One Health at the global level and examine the various ways in which Indian actors have responded to it at the national, institutional and state levels. Specifically, I also discuss the landscape of zoonoses-related institutions operating at the national level and contrast their response to the rhetoric of One Health. Lastly, I conclude this chapter with some examples of state-level intersectoral collaborations in Gujarat and Tamil Nadu, highlighting contrasting bureaucratic cultures and practices. I also introduce the themes of problem framings, bureaucratic systems and institutional memories that I will further develop in the following empirical chapters.

5 INVESTIGATING ANTHRAX

5.1 INTRODUCTION

The previous chapters discussed the way One Health is understood and discussed in India and how health policy decisions are made within the federal administrative structure unique to the country. This chapter takes the example of anthrax, an outbreak-causing zoonosis, to examine how the challenges of disease prevention and control, as well as possible solutions, are conceptualised by human and animal health agencies in the state of Tamil Nadu and their influence on intersectoral collaborations.

I start by discussing the unique properties of anthrax that make it an interesting case study for policy research—its potential to cause fatal outbreaks and be used as a biological weapon—both factors that influence the way it is understood popularly. At the same time, as it affects a marginalised section of population most commonly, the everyday nature of the disease is often ignored, causing it to be placed lower in the disease priority agenda, at least in the human public health sector. I also examine the peculiar epidemiologic and social characteristics of the disease that make it a policy challenge.

I use my experience of shadowing an outbreak investigation team during my fieldwork to examine what the process of investigating and responding to an actual zoonotic disease outbreak looks like. The experience also allowed me to analyse how frontline managers make use of scientific evidence to make practical decisions in a situation of high uncertainty.

I combine the insights gained from the outbreak investigation with my interactions with researchers and programme managers to unpack the social construction of anthrax. One of the themes I examine includes the different kinds of understanding that seem to exist about the disease itself, as well as the risks it represented and how it informed the response to the outbreak.

I discuss the asymmetries of knowledge and how these might invert the power dynamics between the animal and human health sectors. Continuing in a similar vein, I unpack the politics of knowledge while discussing how different types of 'scientific proof' could be cited to justify a particular decision, even as the strong undercurrent of political realities informed the decision-making process.

Finally, I conclude with reflections on the nature of collaborations seen in the field around anthrax, their characteristics and factors influencing them.

5.2 THE ANTHRAX STORY

Zoonotic diseases are frequently categorised as emerging/re-emerging or endemic[20]. Emerging zoonoses are those that are associated with frequent outbreaks and increased risks of human mortality (Daszak et al., 2000). The endemic/enzootic zoonoses, on the other hand, are supposed to be highly prevalent among poorer populations, but not visible in the policy agenda. These are, therefore, also interchangeably referred to as neglected zoonoses (Grace et al., 2017).

As with most mutually-exclusive categorizations, the dichotomy of neglected-endemic and outbreak-prone, emerging zoonoses turned out to be false one, as exemplified by anthrax below. Anthrax incorporates the characteristics of both the categories. It is not reported upon frequently, even in media, unless there is a large outbreak, or when bio-terror weapons are discussed. Apart from stray reports of death among wildlife, most anthrax outbreaks in India have been reported among the tribal communities and workers handling animal carcasses in slaughterhouses and tanneries. These groups are generally considered as among the most marginalized communities in India. However, they are usually limited to a few cattle deaths, thus limiting their spread. One exception is when the meat from diseased animals is served in community gatherings, resulting in a community outbreak (Lalitha and Kumar, 1996; Ray et al., 2009).


THE TIMES OF INDIA

CITY

City Mumbai Delhi Bangalore Hyderabad Kolkata Chennai Agartala Agra

Weather Hindi News

‘Cattle trade, tribal eating habits to blame for anthrax’

TNN | Updated: Mar 31, 2016, 09:52 IST

A- A+

Ranchi: The illegal interstate trading of livestock between Odisha and Jharkhand and the eating habits of people are contributing to anthrax scare in several blocks of Simdega district, believe officials of the state health department and Simdega district administration.

Figure 9: News story on anthrax in Jharkhand (Times News Network, 2016a)

[20] For instance, see Cutler *et al.* (2010), Grace *et al.* (2012a), Halliday *et al.* (2012) & Maudlin *et al* (2009)

Therefore, while anthrax outbreaks are generally ignored (because of the geographic areas and populations anthrax tends to affect), this leads to furthering their neglect by way of limited epidemiological data. And when larger outbreaks of anthrax are reported in the media, it can be argued that they serve to further popular prejudices against scavenging, meat-consuming castes or religious groups.

While the issue of eating beef has assumed greater political visibility in recent years, there has always been some prejudices against consumption of meat by non-Brahmin communities among north Indian upper caste groups (Sarkar and Sarkar, 2016; Vaidyanathan, 2015). In the case of anthrax, the elitist prejudices against trade in cattle, consumption of beef and a tribal identity are all reflected in the news story shown in Figure 9 (Times News Network, 2016a).[21]

If undetected, anthrax has the potential to kill a large number of animals within a short time, and potentially spread to humans as well. The high transmissibility of anthrax, combined with its enzootic presence in places it affects, accounts for high prioritisation accorded to the disease in districts identified as having enzootic anthrax. As described in the following quote from a veterinary epidemiologist from the state:

> *In rabies and anthrax if at all any animals are infected, then they have to be slaughtered – immediately. Every day that the problem is there (situation becomes more serious). My point of view is (that for) anthrax and rabies you have to give more importance. (B14, 15 July 2015)*

As I will demonstrate further in this chapter, the dual-visibility of anthrax has, in some ways, managed to restrict it twice over from gaining a relevant place in the political agenda. Even as it has been classified as a disease of economic importance by the Department of Animal Husbandry[22], which finances vaccination against the disease, there is limited information on its actual burden, contributing to its neglect and limited awareness further still among researchers and practitioners alike. Despite several reports of human outbreaks being reported annually, there is no national level strategy on anthrax as of now. In order to understand the reasons for this neglect, we will need to first understand the peculiar biological and social characteristics of the disease, as discussed in the following section.

[21] For a further discussion on politics of cattle trade and slaughter, see chapter 7
[22] Source: Interview with veterinary officer, C9, 9 March 2016

5.3 DISEASE CHARACTERISTICS

Anthrax has had a long history in public health and in the Indian subcontinent. The anthrax bacterium was the first microbe to be conclusively linked to a disease in 1876 (Sternbach, 2003).[23] It was one of the three major diseases recognised as a priority by the early colonial government in British India, along with cholera and venereal diseases, given the large numbers of cattle and horses needed for food and transportation (Harrison, 1994, p. 62).

Then, as now, outbreaks of anthrax commonly occur among field-grazing animals that can be infected by the spores from earlier outbreaks of anthrax lying dormant in the ground. The disease results in sudden deaths among animals with characteristic bleeding around mouth, nose and hinds. As is the case with many outbreak-prone and fatal infectious diseases, the outbreaks are noticed suddenly and, if responded to early, can be contained in a few days. Due to the sudden and visible nature of animal deaths, anthrax is easily recognizable and allows veterinary epidemiologists to respond early by separating infected herds and ensuring vaccination in and around the infected village.

Anthrax is highly transmissible within animals and to humans from animal fluids. This usually happens in the case of animal owners, butchers or animal hide workers who transport or deal with animal carcasses. Most cases of anthrax outbreaks in India, however, occur in forest fringe areas and among tribal populations who may have consumed meat from dead animals (Lalitha and Kumar, 1996; Ray et al., 2009). The treatment of anthrax is relatively simple with commonly available antibiotics. The fact that anthrax still results in human mortality at all therefore points to its status as a classic disease of poverty that is more likely to have an impact on marginalised populations who, because of distance or social exclusion, have least access to health services.

Anthrax bacilli exist in two main forms: as hardy spores outside human body and, while within an animal body, they exist in a much more vulnerable vegetative form. As one of my interviewees , C1, informed me, anthrax spores enjoy a 'legendary' status within the infectious disease community for their ability to survive in harsh conditions for decades (WHO et al., 2008). This has significant epidemiological implications and it means that once anthrax affects a village, all villages within the eight kilometre radius are placed on an 'anthrax endemic' list requiring intensive surveillance and vaccination for several years afterwards.

[23] This research led to the development of famous Koch postulates of disease causation, a cornerstone of epidemiologic methods even now.

The high transmissibility and persistence of anthrax infection is also the reason why transport and proper disposal of animal carcasses assumes so much importance for anthrax. While bleeding from dead animals is a likely risk for anthrax transmission to humans, it is also possible that the anthrax bacilli can use the blood flowing from the dead animal to flow into ground and form spores that will persist for decades in the environment. This is where one of my respondents, a veterinary epidemiologist, offered this crucial bit of insight to me wherein he showed how an epidemiologist could still get the best of the 'legendary' bacteria:

> *Most people talk about spores and threats of bioterrorism. Don't confuse vegetative forms with spores… vegetative bacteria is fragile. It can't compete with other organisms and cannot survive outside the body except as spores. It takes somewhere between 18 hours and 3 days to form spores in soil in the presence of precise set of environmental conditions.*
>
> *Anthrax, in its vegetative form, is among the most fragile of organisms... If you don't cut open the carcass of a dead animal, chances are the organism will not be able to survive the time needed to form spores. Since transport and burial is so expensive (the WHO recommended strategy of incineration practically impossible), the best alternative will be to seal the head of the animal in plastic bags to prevent blood from coming out. Cover the animal in tarpaulin/plastic sheets, leave it undisturbed for 3 days and only then bury it. By that time, there will be very less chance for anthrax bacilli to survive in closes carcasses. (C1, 27 July 2015)*

Between 2009 and 2014, 87 different outbreaks of anthrax were recorded in Tamil Nadu, with cows and buffaloes being twice as likely to get affected as the smaller sheep and goats.[24] However, this figure is likely an underestimate. As the veterinary officer described to me:

> *Most anthrax diagnosis in the field is presumptive; when the vets find sudden deaths and bleeding from the natural orifices. The Central Referral Laboratory did not culture anthrax because they did not have BSL-3 (Biosafety benchmark) facilities. (C1, 3 March 2016)*

And perhaps that is why among veterinary epidemiologists reporting on the disease:

> *The word outbreak was not used to describe the situation. We always used the term 'suspect outbreak' of anthrax even if some animal died … since the disease was not laboratory confirmed. (C1, 3 March 2016)*

While strictly speaking, the WHO guidelines seem to support this stance (WHO et al., 2008, p. 119), this is an old trick used frequently by public health agencies for producing lower disease estimates. As I had personally observed before in the case of rabies in the same state, the lack of diagnostic capabilities was actually helpful to public health officers in

[24] Source: Interview with veterinary epidemiologist B3, 27 February 2015 & 17 July 2015

reporting decreased disease incidence and contributed to imprecise epidemiology (Abbas et al., 2011b).

A real-life implication of this failure to enumerate outbreaks was brought home to me in another interview. A scientist working on anthrax described to me the situation in the neighbouring states of Andhra Pradesh and Karnataka where lack of information directly resulted in decreased resource allocation, and a reduction in state capacity to respond to the disease, as follows:

> *Anthrax is now being neglected in Andhra Pradesh and Karnataka states. They have stopped producing Sterne's vaccine[25] citing lack of cases. But this is because the diagnostic capacity is not there… People are not trained in simple microscopy (for detecting anthrax). It is all a 'hushed up conspiracy' where no one wants to look at and talk about anthrax. (B15, 1 Mar 2016)*

On the flip-side, despite the lack of awareness, news about a new disease is not always welcome. This is best illustrated by the experiences of Dr Jacob John, a Christian Medical College (CMC) microbiologist, who helped establish the presence of anthrax in Vellore through his disease surveillance programme in the nineties (George et al., 1994). As he recalled to me:

> *The Tamil Nadu secretary calls in and he says, "Why are you putting in anthrax in NADHI Bulletins? There is nothing in anthrax". So I explained to him saying that "We are looking at all human diseases, and therefore, this came out" and then he said, "Please don't repeat this". I was smiling inside myself. Any other country, people would have patted me on the back that we have done good work. But here denialism is there. (Interview with Jacob John, 27 July 2015)*

In a real-life illustration of the cycle of neglect affecting neglected tropical diseases (NTDs), as discussed later in chapter 8, a lack of attention to anthrax resulted in reduced information about the disease, which further feeds the neglect of the disease. This phenomenon further comes through in my examination of everyday decision-making practices around anthrax, as observed in the aftermath of an outbreak of the disease, as discussed below.

5.4 ANTHRAX AT THE COALFACE

Vellore

As described in chapter 3, I made multiple visits to the state of Tamil Nadu during the course of my fieldwork, and this included two visits to the hospital town of Vellore. One

[25] It is the most commonly used anthrax vaccine strain for animals which was developed by immunologist Max Sterne back in 1937 (Turnbull, 1991).

time capital of former Nawabs of Arcot, it is now best known for its huge leather industry[26] and its two educational institutions, the venerable Christian Medical College (CMC) and the recently built Vellore Institute of Technology.

Academics at CMC Vellore have been reporting anthrax at least since 1977, when it was still considered to be a 'rare' disease among humans (Koshi et al., 1981). However, once they started following cases more closely, they managed to diagnose around 50 people with anthrax over the next 20 years (Lalitha and Kumar, 1996). The increased reporting of human anthrax cases was, no doubt, also helped by a pioneering mail-based multi-disease surveillance system put in place by public health physicians at CMC in the 80s (Jacob John et al., 1998). The surveillance project was responsible for uncovering an outbreak of anthrax in neighbouring Chittoor district in Andhra Pradesh in 1990 and establishing its continued presence in the district (George et al., 1994).

According to local veterinarians:

> *Approximately twenty outbreaks of anthrax have taken place among animals in last two decades in Vellore, though now it is less in frequency. Because of the frequent reporting of anthrax from various (administrative) blocks in the district, the entire district has been considered as endemic since 2011. This means that anthrax vaccination campaigns are conducted regularly for all domesticated animals. We estimate almost 80% coverage (C1, 27 July 2015).*

While many of the people affected by anthrax were found to have handled animal hides and carcasses, no outbreaks have been reported among the tanneries in and around Vellore. Almost all the 'zoonoses experts' I met with outside Vellore, cited consumption of and working with dead meat within tribal communities as a major source of anthrax spread. In the context of Vellore, with its numerous tanneries, the implication was that it must be more common among the people working in the unclean professions associated with dead animals. This mirrors Marsland (2014) and other anthropologists' depiction of senior health officers' understanding of local traditions being a source of disease.

However, when I interviewed veterinary epidemiologists based in the district, they had a different understanding of the disease:

> *I have never come across tannery workers with anthrax. There are so many chemicals being used in the tanneries that I doubt that any bacteria will survive. Also, most tanneries now provide much better protection for their workers, like gloves, shoes, etc. Most people who get anthrax handle carcasses or have consumed meat. These are obviously people who are poor, illiterate and who don't have access to health services. (C1, 3 Mar, 2016)*

[26] Vellore has a sizeable leather production and processing units, including tanneries, contributing more than a third of India's leather exports. (District Administration-Vellore, 2016).

I had a unique opportunity to observe how some of these concepts played out in real life settings when I chanced upon an outbreak of anthrax in my second visit to the district. I learnt about a potential outbreak of anthrax on 4th March 2016, my first day in Vellore, when I went to meet the district public health officer, whom I will refer to as Dr Sunil[27]. Apparently, he had just received information of sudden deaths of tens of sheep which took place in Keelvenkatapuram village in Nemili block a few days before.[28] He was in the process of putting together a Rapid Response Team (RRT) mandated by the national disease surveillance programme that could conduct the initial outbreak investigation.

I had the right references and permissions, and so could accompany the RRT to the affected village. The RRT consisted of a young medical graduate, who was also the district epidemiologist and whom I will refer to as Dr Rajiv, as well as two health workers, along with another officer we met in the village (see Figure 10). What follows are edited excerpts from my field notes that establish the basic facts of the outbreak and my observations.

Outbreak Investigation

Figure 10: Rapid response team surveying households in affected village (faces blurred to protect anonymity)

> *After waiting for a short while for the driver, our 9-seater car started for the affected village, about two hours' drive from the district headquarters. I learnt from Dr Rajiv, the district epidemiologist, about the reporting of the outbreak. Apparently, the initial information (of sudden deaths in sheep) came not from animal husbandry department, but from a municipal officer who happened to be visiting the area the day after several animals died in the village. He promptly informed the public and animal health officers at the same moment I was visiting the DDHS office. (Field notes, 5 March, 2016)*

Luckily, no human cases had been reported so far and the brief for the outbreak investigation team was to assess the extent of the outbreak and identify potential risks for

[27] Referred to as the Deputy Director of Health Services, or DDHS, in Tamil Nadu.
[28] Some information about the outbreak can be found on ProMED-mail (2016).

the human population in the area. When we entered the village for the first time, it was at least three days since the sudden and large number of animal deaths had started. There was no sign of the veterinarians. However, I was informed that they were conducting their own parallel investigations, but were a bit stretched as they were also conducting a state-wide vaccination campaign against Foot and Mouth Disease (FMD) the same week as the outbreak.

> *The public health team was told by some of the villagers that the deaths (among sheep and goats) had been taking place since January and were not a recent phenomenon. The village had lost around 450 sheep/goat out of a total small animal population of around 1,450 in the village.*
>
> *They did not inform the authorities (about the deaths) and went on disposing off the animals in the 'usual 'way'. We were told by a young farmer that while they might not be aware of anthrax, most people know that the meat of dead animals is not to be eaten, except for some 'illiterate and poor'. Some elder people also say, 'why do you want to let it go to waste?' (Field notes, 5 March, 2016)*

One of the health workers in the investigation team apparently belonged to the same village. We came to know from him that most goat/sheep owning families stayed in 2-3 small pockets in the village. All animal deaths had taken place only within these households. Upon further enquiries by Dr Rajiv, the young and enthusiastic epidemiologist, we also learnt that the deaths had only taken place among animals which used to go for grazing in a dried riverbed, around 7-8 kilometres from the village. One of the explanations for the outbreak I later heard was that torrential rains some time ago might have loosened the dormant spores already present in the river bed and brought them to the surface.

I received an interesting lesson in the linguistic culture of different disciplines when Dr Rajiv was planning his village-wide survey and started referring to dead animals as 'deceased', later corrected himself, but was still unsure whether to use the epidemiological terms 'casualty' or 'mortality' instead! The public health investigation team also proved to be more accepting of the community's version of animal death toll. Some farmers claimed that the deaths had been taking place in smaller numbers for two months and a total of 450 animals were dead because of the disease. This was the number noted down by Dr Rajiv in the beginning, even though this fell in the face of anthrax being the cause (as it usually occurs in short episodes and subsides immediately following treatment/vaccination).

I met some veterinarians in the area a few days later as they were completing their vaccination of livestock against anthrax (see Figure 11). I found them to be much more

pragmatic. They confirmed the outbreak as being of anthrax, citing laboratory reports and mentioned potential claims for government benefits as one of the possible reasons for higher numbers being reported. Usually anthrax does not result in more than a handful of animal deaths, possibly because most outbreaks take place in the more expensive cattle that are reported earlier and also because at least in Tamil Nadu, a good proportion of livestock are insured and consequently, most of them are fully vaccinated against major diseases, including anthrax. The sheep/goats in the affected village are often taken to large distances for grazing and, according to the veterinary officers, might have been missed during the vaccination rounds in the village.

Figure 11: Goats being vaccinated against anthrax in Vellore.

Controlling an outbreak

Dr Rajiv being the junior-most doctor, and the only one on an *ad hoc* contract in the district public health office had conducted the bulk of the outbreak investigation so far. The public health department's RRT made two more field visits in the course of three days. No human cases were detected and the department could afford to deploy its manpower in other places.

Serendipitously, on the last day of my stay in Vellore, the public health office learnt that a few residents of the affected village were thought to have reported to a hospital with cutaneous anthrax. This is a milder form of anthrax infection. It is restricted to the skin and typically develops in exposed areas following the handling of infected animals. It is supposed to be treatable with antibiotics.

Now that the outbreak had spread to human populations, there was an increased level of urgency. Accordingly, I was asked to come to a primary health centre near the village where another RRT, with more senior members consisting of state-level experts, was supposed to assemble. A specialist team from the Institute of Vector Control and Zoonoses Research (IVCZR), a specialist zoonoses research institute from nearby district of Hosur, was expected to come and assist Dr Sunil, the DDHS.

The IVCZR is administered by the Tamil Nadu department of health and is primarily concerned with training medical officers and conducting outbreak investigations of common vector borne diseases. It is important to highlight here that while a veterinary officer can be asked to contribute to an outbreak investigation, this is not the norm and I was not expecting one to come. I arrived at the meeting point around the same time as Dr Sunil and Dr Rajiv. We had to wait for around an hour before the team from Hosur arrived after a five-hour journey. Their team consisted of a senior public health officer, an Additional Director (who was senior in the bureaucratic hierarchy to Dr Sunil), a veterinary epidemiologist as well as two field workers. Apart from the veterinarian who had been deputed to the IVCZR from Animal Husbandry department, rest of the 'experts' turned out to be either medical entomologists or vector borne disease specialists.

The meeting started in earnest upon the arrival of the team from Hosur. The officers chose to have most discussions in Tamil, a language they and the staff were clearly more comfortable in, practically insulating me from the conversations. From what I did manage to capture, based upon passing snippets of English terms and the periodic updates from Dr Rajiv, I realised several things:

> *First, the committee did not seem to be in favour of releasing information bulletins. This could be because they felt that it had the potential to spread news about the outbreak beyond the affected village and generate panic, which was not advisable given the impending elections and politically polished atmosphere in the state.*
>
> *Secondly, and more worryingly, the consensus among the officers seemed to be heading towards providing chemoprophylaxis to all the residents in the village. The reason for this, again, was their need to show proactive approach of the health department (this being the election season). This was done to pre-empt any criticism of the health department, in case the outbreak had a political fallout. Since no one seemed to know what the protocol was, Dr Rajiv then used his smartphone to dig out the guidelines from the internet. He read out the CDC guidelines, which mentioned 60 days of Ciprofloxacin as preventive for persons exposed to inhalational anthrax spores. (Field notes, 11 March, 2016)*

This puzzled me as I was not sure if long-duration prophylaxis with antibiotics was suitable, or safe to be given in the context of a limited outbreak such as this one. As I was

not aware about the CDC guidelines on anthrax on the day, so I had to look them up afterwards. I found that the CDC had started developing guidelines for prevention of anthrax in response to the international panic surrounding the US anthrax terror attacks in 2001 (Inglesby et al., 2002) and are primarily directed towards a high-risk bioterror scenario.

For instance, in its latest set of guidelines, the authors acknowledge that the disease is "not uncommon among persons who interact with animals" in LMICs, followed immediately by a counterpoint:

> *Biodefence experts often place* Bacillus anthracis *at or near the top of the list for potential threat agents. Inhalation anthrax is particularly deadly…*
> (Hendricks et al., 2014)

The WHO guidelines (2008) make it clear that chemoprophylaxis should not be used in natural outbreaks, and definitely not on a massive scale, nor for a long duration. The CDC guidelines, on the other hand, suggest a 60-day course of antibiotics along with three-doses of anthrax vaccines for people suspected to have been exposed to anthrax spore attacks.[29]

With the exception of NTDs, chemoprophylaxis is not a common population-level public health strategy (Hotez et al., 2007). And even there, the practice is being questioned (Parker and Allen, 2014). The veterinary sector, especially in India, had a more relaxed approach to the use of antimicrobials (Van Boeckel et al., 2015). Is it possible that the discussion on using antibiotics as chemoprophylaxis may have been initiated by the only veterinarian in the team? As I observed in my notes:

> *The veterinary officer in the RRT seemed to be the most authoritative with even the senior officers deferring to his expertise and he supported the intervention (chemoprophylaxis) enthusiastically, even citing the national guidelines as well as personal experience of a community trial conducted in Hosur to support the strategy. (Field notes, 11 March, 2016)*

I have not been able to find the trial on chemoprophylaxis cited by the veterinarian, and think it might have been conducted in animals and not human populations. This is because short duration treatment with antibiotics is actually recommended only among animal populations in certain situations.[30] However, I did find the guidelines suggesting chemoprophylaxis for anthrax prevention among humans. This was in a manual co-published by WHO India and the NCDC (NCDC, 2006), although no references were cited

[29] For CDC guidelines, refer to Stern *et al*. (2008), Wright *et al*(2010) and Hendricks *et al*(2014)
[30] WHO (2008) suggests administration of between 1 and 3 doses of antibiotics is preferred to administering live vaccines to animals in non-endemic areas where the disease has been identified early.

for the recommendation. In fact, I am not sure if two months of antibiotics have been successfully administered and tested at a population level in any part of India. Interestingly, studies following up the response to the US bio-terror attacks in 2001 found that even at the height of anthrax attacks and panic in 2001, the overall adherence for a 60-day antibiotic regimen was among less than half the population (Shepard et al., 2002).

I had my reservations about the inappropriateness as well as potential for harm from distributing large doses of antibiotics. It looked like Dr Sunil was also not completely convinced, or at the very least, wanted to secure his superior's approval before making the decision. Accordingly:

> *they decided to call up the chief public health officer of the state (the Director of Public Health) for a final opinion. After a few minutes' briefing over the phone in Tamil, Dr Sunil said that that he has secured the DPH's approval. The DPH, apparently, supported the decision of the team to go ahead with chemoprophylaxis, as the political risks of having human cases outweighed other concerns (Field notes, 11 March, 2016).*

All this while, we had been having discussions in the health centre. Afterwards, when it was late afternoon and all the major decisions had been taken, the RRT members decided to make a quick visit to the village and inspect the location of animal holdings and burial (Figure 12) before the Hosur team headed back on their five-hour return journey.

Figure 12: Burial pit for dead animals (incinerated and covered with bleach)

It was as we were preparing to get into the vehicles that the apprehensions of the RRT members regarding the outbreak became clearer to me:

> *First, it was decided that only two cars would visit the village so as to prevent drawing too much attention to the team. The presence of anthrax in the village also proved to be a disquieting aspect of the travel. Now that the disease had proven serious enough to warrant month-long antibiotics for the village, it was felt that all the members of the RRT should also be adequately protected, and hence popped a pill each before heading off for the visit.*
>
> *Even though several people including Dr Sunil, Dr Rajiv, another Medical Officer and several other workers had already made multiple visits to the village, they all submitted to our collective fear about the germ and took a strip each from the health centre pharmacy, sharing their antibiotic blister packs with others who didn't want to queue for one. I couldn't help but feel that in some ways it was a moment where the team was bonding against the common threats to their individual and professional safety. (Field notes, 11 March, 2016)*

I must confess there were moments in the field and immediately afterwards when I felt like giving into these emotions and considered taking the antibiotic strip offered to me. However, I reasoned at the time, there was only a minimal risk to me of contracting inhalational anthrax in the short time I would spend in the village. I could not catch the other forms of anthrax without physically coming in contact with either sick animals or contaminated objects.

I knew I would not be putting myself at too much of a risk by refusing the antibiotic, except possibly, exposing myself to jokes at my expense by my fellow passengers in the car as we headed into the village. However, the feeling that I might be putting myself and people around me at risk persisted for a while. This was especially pronounced when I took the train to Bangalore immediately afterwards and visited friends in their homes.

Even though I spent only a few days there, visiting an outbreak-affected village made me experience the disease at a much more personal level than might have been the case otherwise. In addition to experiencing the anxieties of being exposed to a fatal disease outbreak, albeit in a very limited way, it also gave me an opportunity to reflect about how we process information and make decisions in an uncertain, risk-prone environment, as I describe in the next section.

5.5 EMERGENT THEMES

Even as we are changing into a much more connected knowledge society with very different ways of producing and using knowledge (Castells, 2011), we are faced with re-imagining our understandings of expertise. It is not always be possible to rely on a single

definitive source of expertise, or to interpret data in a specific way for making decisions, given the fractured and distributed nature of expertise itself in the modern world (Collins and Evans, 2002).

When faced with a rapidly unfolding situation with high degree of unpredictability about its impacts, as in the case of the anthrax outbreak in Vellore, it becomes difficult to select one response as being the most appropriate one. Another factor that complicates any *post hoc* analysis of decision-making is that the professionals tasked with interpreting evidence and making decisions on behalf of a population, such as the epidemiologist in the field or the scientists making guidelines have their own social, political or institutional commitments that can influence their roles as translators (Jasanoff, 2003; Wynne, 1992).

I unpack some of these themes in the discussion below.

The paradox in public health practice: Publics vs health

The RRT team's visit to the village was uneventful on that day. This included short stops at a burial ground and some households. We also wanted to visit the grazing lands in the nearby village, but turned back when they proved difficult to locate and we got late. However, I could not help but notice the paradoxical relationship between the public health servants and the public they are supposed to serve. The generally accepted picture of Tamil Nadu as a state, as represented by its political regime, is that of an omnipresent, benevolent and paternal state, especially for the less well off (Deshpande et al., 2017; A. Wyatt, 2013a). On the other hand, communicable diseases control policies are frequently associated with police powers in India and some of the most passionate debates about limits of state power in India and elsewhere have always challenged this notion (Patralekha Chatterjee, 2006; Kakkar et al., 2010).

The fact that the outbreak took place two months before the elections only served to heighten the tension between the paternalist, populist face of the government and the regulatory police powers it might need to manage the health emergency.

The positions of the state and citizens were not really in conflict in this case, and it should have been in the common interest of the public health officers as well as the affected village residents to ensure a prompt response that limited animal diseases, while preventing serious human cases from occurring. However, the public health officers chose to exercise what might appear to be a more pro-active option by resorting to a long-duration antibiotic course, instead of strengthening surveillance and maybe educating people on personal protection, which might have been a more conservative, but standard response..

Despite the many possible drawbacks of chemoprophylaxis[31], the public health officers still decided to go ahead with the intervention. Could this be because the supposed outbreak did not affect the entire village but was, in fact, confined to a small community of shepherds in the village? And even among the shepherds, those at increased risks were the poorer ones who could not afford to feed their herd and therefore had to send them off for grazing. While the alacrity of the public health department in responding to the outbreak was indeed commendable, this small section of affected population in all likelihood would have been satisfied with receiving the pills, even if they did not end up taking them.

Figure 13: Backyard goat-keeping.

Marsland (2014) cites her experience in Tanzania where the public health officials thought of the public as faceless crowds rather than as a discerning group that needed to be a part of the health policy debates. This had several parallels to the situation in Tamil Nadu, where the state officers preferred to deal with the 'crowds' with a hands-off intervention instead of engaging with them in promoting awareness and encouraging social response of detection and quarantining. In addition, it is likely that, given the caste taboos against consumption of meat and raising animals for slaughter, by the obviously poor shepherding families (see Figure 13 & Figure 15) among the more privileged bureaucracy might further contribute to the othering of the poor and the diseased (Fuller and Narasimhan, 2015; Sarkar and Sarkar, 2016).

[31] Apart from the risks of developing anti-microbial resistance and causing individual harm, there were also the practical concerns of feasibility of ensuring coverage and adherence to a long duration anti-microbials regimen.

Shaping knowledge and expertise

Developing an insight into a complex biological and social problem like anthrax requires both strong health disciplinary training as well as a well-honed understanding of social contexts. In the course of my investigations into anthrax, I repeatedly came across situations where these two streams of understanding were in tension.

The first example is that of the disposal of animal carcasses. The preferred method recommended in all guidelines is incineration. This seemed fine to me when I was doing my literature review and before I was actually confronted with the logistics and costs involving transportation and burning of large animal carcasses in aseptic conditions. A veterinary epidemiologist who had worked on anthrax prevention for several decades pointed out to me the limitations of the incineration approach and the presence of alternatives. The WHO/FAO/OIE guidelines (2008) proposed a more practical alternative for carcass disposal in resource-constrained settings. This was to seal the animal head in plastic bags, cover the unopened carcass in tarpaulin sheets and keep it above ground for three days before burying it in a deep pit. The logic went that once the carcass is allowed to putrefy for three days, the anthrax bacteria in the bloodstream would die away as they would not be able to compete with other, more aggressive bacteria involved in the putrefaction process. Therefore, there was much less chance of any anthrax spores surviving.

On the other hand, instead of highlighting the carcass disposal strategy, the national guidelines developed by the NCDC labelled it as 'The Last Resort' (sic). After discussing different variants of the incineration as well as the untested rendering process covered in almost three pages, the guidelines describe the practical option of burial in half a page (NCDC, 2006, p. 14). Unlike the WHO guidelines that offer all options, there is a clear judgement on the part of the NCDC in promoting certain disposal methods over others. However, there is no explanation or citation of another authority to justify their stance.

A similar example of misplaced power could be seen in the authorities' decision to distribute antibiotics to the entire village population. As discussed in the previous section, this was done after a quick search on the CDC website for anthrax prevention on the district epidemiologist's mobile phone.

As discussed before, the CDC guidelines on chemoprophylaxis were obviously developed under a different set of circumstances targeting a different population. While the easy availability of information on a smartphone is definitely an empowering technology, in this situation, it possibly resulted in an ill-advised decision when combined with a set of

contributory factors. The guidelines are not directly published by CDC; instead, they link to other publications and websites from the CDC page on anthrax prevention. Even to me, when I tried accessing the same documents on a desktop, it took some time to figure out the authorship and context for these publications.

The CDC guidelines do not address the situation of endemic anthrax directly and the WHO mentions it not on the anthrax webpage, but deep into a PDF document. It is possible that a lack of easily accessible explanations on the CDC combined with relative inaccessibility (on a smartphone browser) of the PDF-based guidelines of WHO might have resulted in that link coming up on the smartphone of the epidemiologist.

Even as the CDC and WHO guidelines were hard to access on the small screen of a smartphone deep in rural Vellore, the factor that is most likely to have tilted the RRT's hand in favour of chemoprophylaxis is a single-sentence, unreferenced recommendation to provide chemoprophylaxis to exposed persons by NCDC, mentioned below:

> *Chemoprophylaxis – asymptomatic exposed individuals are put on a four week course of doxycycline 100 mg twice daily or ciprofloxacine 500 mg twice daily.* (NCDC, 2006, p. 11)*(Figure 14)*

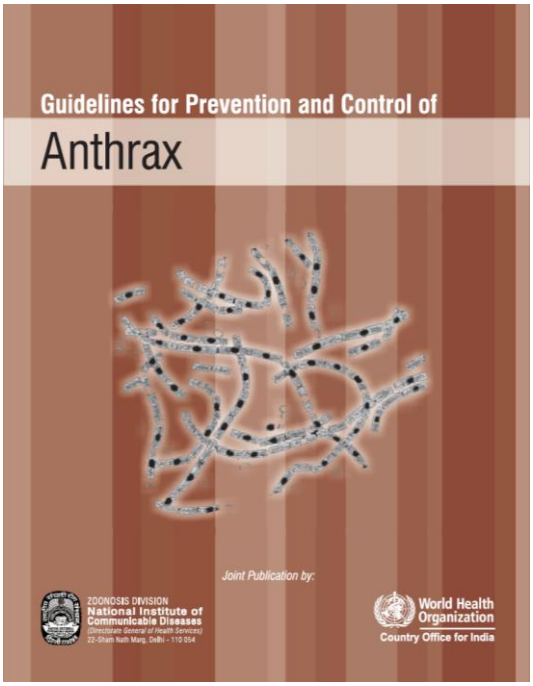


Figure 14: Anthrax guidelines (NCDC, 2006)

A third related illustration of the dichotomy of 'high vs low science' could be made in relation to the diagnosis of anthrax as an outbreak. Anthrax is an easily demonstrable bacterium using basic microscope and staining techniques, provided the sample is taken in

a timely manner. Blood cultures are definitive proof of an infection, but a positive blood smear examination in an outbreak environment should be enough to make a decision.

Figure 15: Traditional sheds for cattle rearing.

Again, the theory looks simple. But the vet confirming a sample as positive could potentially be exposed to two kinds of risks. One is infection by the bacteria if blood is not drawn properly. Also, the risk of exposing themselves to potential reprimands for declaring a false positive in case it turns out negative later. We have already seen how it might be in the interest of public/veterinary health officers not to arrive at a conclusive decision to prevent them from reporting actual numbers. Having a provisional clinical diagnosis is enough for them to start a response while the responsibility to declare an outbreak is passed on to a laboratory.

The field veterinarian I interviewed described the best way to confirm an anthrax infection without waiting for a blood culture report:

> *If the animal is still alive, chances are there will be low levels of bacteria in its blood as it will be filtered by the spleen and will not be easily diagnosed in blood smear. Bacteria levels typically peak just around the death of the animal—there are lots of bacilli so easier to identify in blood smear with some experience. Most districts have microscopes, but whether they have capacity to detect or not…. Sometimes in outbreaks, we ask local dispensaries for diagnosis…. It's a simple procedure. Conduct blood smear analysis with simple microscopes & confirm increased clotting time of collected blood. Take blood from jugular vein as it is easy to sample with minimal risks. If you find the blood clotting normally, it is not likely to be anthrax (C1, 3 March 2016).*

Policy researchers are well aware of the distance between policy formulation and its translation (Walt et al., 2008; Zahariadis, 2007). In relation to service delivery, some even say that a policy is only as good or bad as the way it is envisaged and shaped by the bureaucrats on the street (Lipsky, 2010) or control rooms (Schulman et al., 2004), reinterpreting polices to manage daily policy crises.

However, there are additional issues related to the growth of expertise. As demonstrated in the above three examples, there are circumstances where even actors with the capacity to question such expertise ceded authority to more distant, possibly out-of-touch institutions because of perceived competence. This was true in the case of CDC, which framed chemoprophylaxis guidelines for a different context and did not bother to include a disclaimer for their applications in non-US settings. This was also true for the NCDC that exercised its supposed technical authority by providing vague and unjustified recommendations regarding chemoprophylaxis and carcass disposal.

A case can be made for highlighting the practical aspects of field epidemiology and empowering professionals on the ground to be able to make the decisions through capacity building and provision of resources. If, as described in the third example above, simple microscopy might help make an informed decision in the field, or if the guidelines gave primacy to practical experiences, it is likely to affect the speed and quality of decision-making on the ground.

Political contexts of outbreak responses

This experience served to reinforce my understanding that it is not possible to separate the policy from the politics of decision-making. I was initially not able to reconcile the image I had had of the DPH with his decisions. I had met the DPH on several occasions and I always found him to be a well-informed person, clearly an epidemiologist at heart. A graduate of the prestigious two-year graduate programme in field epidemiology, offered by the National Institute of Epidemiology, I found him to be quite aware of the challenges posed by zoonoses and having well-thought-out position on limitations of current intervention strategies.

However, his reasons for taking a conservative decision might have been as old as bureaucracy itself — passing the buck. When confronted by conflicting choices, both citing science and reason (as in the case of chemoprophylaxis vs surveillance alone), the officer in the field chose to pass the buck to his senior in the capital. In such a situation, the Director could be justified in choosing a less risky option that seemed to have the

endorsement of key people in his team rather than listen to arguments about a relatively distant threat of antimicrobial resistance.

Scholars in science and technology studies have highlighted similar themes in other contexts. Stirling & Gee (2002) questioned the workings of expert committees and demonstrated the plurality of views that existed within the scientific community about a specific policy issue. This is in contrast to the political pressures to "push attention from 'plural conditional' to the 'single definitive'" (Stirling, 2010, p. 1030). This, he argues is because of an overwhelming reference among decision-makers to minimise ambiguity and promote the notion of 'risk' as a quantifiable, and by extension – creating a controllable entity. Wynne (1998), in his famous study of Cumbrian sheep, questions the divide between the 'experts' and lay publics, again centred around notions of risk and uncertainty.

Scholars have argued for rethinking the notion of expertise given the fact that there is increased awareness about contested nature of meanings as well as a more human understanding of expertise (Collins and Evans, 2007; Jasanoff, 1992). When bureaucrats and scientists can reflect the same biases as the societies or institutions they come from (Corbridge et al., 2003; Jasanoff, 2003), there is hardly room for surprise when the government technocrats turn out to be similarly motivated by the social mileu or institutional politics.

It is quite likely that the NCDC, in an attempt to increase the credibility (and compliance) of its guideline document, adopted a prescriptive tone without any nuance, or references to external publications as reflected in the quoted sentence earlier. Including nuance in its guidelines, is likely to have led the NCDC to acknowledge the presence of external sources of expertise as well as a scope for reinterpretation of its guidelines by implementing officers – both decreasing its perceived credibility.

The decision of the DPH, too, is likely to be reflective of the political pressures on 'closing down' on complexity in the form of a visible intervention that will be acceptable to local community and saleable to the political leadership on the cusp of an important election.

5.6 PARTNERSHIPS AROUND ANTHRAX

So far in this chapter, I have examined how ecological and epidemiological characteristics of anthrax inform its social framing, viz. having simultaneous identities as a disease of international priority due to its bio-terror potential, as well as being a disease of poverty (Institute of Medicine (US) Forum on Microbial Threats et al., 2006; WHO, 2006). I also examined decision-making around anthrax using the example of an outbreak

investigation. This involved reflection on the politics of knowledge and expertise. Building upon this discussion, I will now return to the principal concern of this inquiry, which is to examine collaborations around zoonoses and analyse their dynamics.

One major way in which the veterinary sector differs from the human health sector is in their operational incentives.[32] The animal health sector views livestock as a productive asset and therefore it can choose interventions using strictly monetary principles. For human health, on the other hand, moral and methodological difficulties abound in valuing human lives in monetary terms (Dorman, 1996, p. 51), and therefore the mandate of health sector is to promote something more esoteric, such as general well-being. Therefore, the central notion of economics in animal husbandry could be a reason why, when it came to setting priorities, the economic grounds influenced the veterinarians' decision to spend fewer person-hours on anthrax and more on the concurrent state-wide FMD vaccination campaign. This was also the reason cited by them to explain their limited presence in the village and why I was able to schedule interviews with them only in the latter half of the outbreak. FMD is a disease of significant economic importance, resulting in annual losses of $US3 billion to India (Pattnaik et al., 2012) and hence is a high priority.

In the absence of a robust animal insurance system or compensation for loss of property and costs involved in transport and burial of dead animals, finances often assume importance in government – farmer interactions.[33] While animal disposal seems to have been an organised effort, it did not appear to me as if the farmers in Vellore were getting compensated for their losses. In such a context, any talk of formal collaboration among animal and human health practitioners will need to spell financial responsibilities clearly. As the public health department is believed to have access to more funds than animal husbandry, the district veterinary officer, who must have been grappling with compensation requests at the time, had this to say about working together with the health sector when I met him in his office (Figure 16):

> *You might have coordination…but the main problem with anthrax is who foots the bill, such as, for burial of carcasses—there are no guidelines. (C9, 9 March 2016)*

However, the close association of the animal husbandry sector with finances was looked at in a different light in the health sector. Jacob John, the retired microbiologist and infectious

[32] See chapter 2

[33] While subsidised insurance schemes have been launched in different parts of the country, including Vellore (Department of Animal Husbandry Dairying & Fisheries, 2009; Tamil Nadu Agricultural University, 2009), vaccine preventable diseases such as anthrax are commonly excluded (Agoat, 2017). Unfortunately, since majority of the animal farming sector is unorganised, these animals are seldom immunised.

diseases researcher from CMC, had this to say about his assessment of the motivation of veterinarians, and the differences in their outlook with physicians:

> *I admire the fact that the veterinarians are present in rural areas where animal diseases are. So you get veterinary services where even the health services are not available. But then animal lives cost money, human lives are cheap… (Jacob John's interview, 27 July 2015)*
>
> *Yes, they (the veterinarians) are much more receptive (to discussions around zoonoses) as they don't have this airs as medical people have—few medical people think as if they are Gods walking around—you cannot dialogue with people like that as they know everything. There is no humility with medical people, but veterinarians don't have all these airs. They are easy and they ask genuine questions. But the doctors usually even when they are called for meetings, they don't ask any questions, so my suspicion is that they want to hide their ignorance ,so they don't ask questions. So, yes the veterinarians may be more scientifically oriented as compared to medical people who might be less scientifically oriented, but they practice medicines more, like practitioners—you know something and then you apply it and make money. (Jacob John interview, 27 July 2015)*

Of course, this portrayal of veterinarians as scientist-practitioners who are well grounded in rural realities sketches a stereotype that most veterinarians would not mind for their profession. Moreover, I suspect the image speaks as much of Jacob John's perception of his profession as it does of the veterinarians.

Figure 16: District veterinary hospital & Animal Husbandry Office, Vellore

When I spoke to a senior veterinary researcher who is a leading zoonoses researcher in south India, about his perception of the veterinarians' standing with the public health

community, I got a different response. He recalled how, despite being neglected by public health community in India, his work on anthrax and other zoonoses helped him acquire visibility internationally, albeit selectively.

> *One of the main problems is that, at least in this state, the medical profession doesn't consider us (veterinarians) at par…. While zoonotic diseases might generally be neglected, the researchers working on them gain lot of recognition. I got more recognition for my five years of work on zoonoses than 20 years' work on other non-zoonotic pathogens. There is a lot of international interest in anthrax, including its potential as a bio-weapon. I have been interviewed by different international experts who want to find out more about anthrax work in India. (B15, 1 March 2016)*

However, just like Jacob John's perception of the veterinarians, the researcher's perception of his profession is also likely to represent one aspect of the veterinarian's professional standing. The deliberations of the RRT demonstrated to me how easy it might be to disrupt the professional power dynamics at times. Tamil Nadu is a state where the government and its bureaucracy are quite empowered.[34] Hence, the decision-making is often hierarchical. During my interactions with the public health and veterinary officers in the course of the outbreak, the pecking order was clearly established with the ranking officer given the chance to speak first and last. But it was interesting to notice the disruption of these hierarchies when the bureaucratic seniority contrasted with disciplinary expertise in the case of the outbreak response team meeting. Clearly, those leading the discussions were all relatively senior officers (with one Additional Director being more senior than the others) and the DDHS being the responsible officer in the district. However, as this was the first anthrax outbreak in the district in 3-4 years, they were all dealing with a disease they were less familiar with. Consequently, they routinely deferred to the suggestions from the veterinary officer accompanying the expert team as he clearly had more professional experience with the disease. As discussed earlier around the outbreak response, it is likely that the veterinary officers' familiarity with some of the interventions might have helped push the discussion the way it ended up.

A last note on informality underpinning intersectoral collaborations. While I was not able to witness veterinarians conducting joint investigations with the public health team in the field, I did meet them separately afterwards in the village, as well as at their district headquarters (Figure 16). I learnt that the DDHS and district veterinary officer talked at least two times on the phone and met once in the veterinarian's office. So there was some

[34] See (Fuller and Narasimhan, 2015; Gupta et al., 2010; Springer, 2000).

level of communication at all stages of the outbreak. This made the quote from the veterinary officer (below) all the more surprising for me.

Infectious disease literature frequently cites the importance of using animal diseases as early warning signals for potential human health event (Eidson et al., 2001; Wolfe et al., 1998). Citing similar arguments, when I asked the district veterinary officer what he felt about the ongoing communication between animal and human health agencies in Vellore, I was expecting to hear a response affirming the importance of communication, but did not expect the conditionalities he included in his response:

> *If we have information that people might have consumed (potentially infected) animal meat, we inform the local health centre, but don't usually go to the district level itself. On the other hand, if any anthrax patients are admitted to the bigger hospitals in the district, they let us know as well (C9, 9 March 2016).*

In effect, in the above quote, the district veterinary officer confirms his support for the idea of having regular communications with health department. What I found remarkable, especially in a state with strong bureaucratic traditions such as Tamil Nadu, is that the officer preferred the sharing of information done informally at the peripheral level without involving his office. This was in contrast to the usual approach in Tamil Nadu where, at least in my experience, the usual approach of public servants is to insist on 'following proper channels' for accessing information.

However, I had noticed a similar predilection for delegating communications through informal channels at subordinate offices in my interviews with state officers. For instance, the state veterinary epidemiologist in Gujarat described the importance of district veterinary office in coordinating among different departments as follows:

> *And one more thing I would like to tell is that…the activities which are being done at district level—he (district veterinary officer) is doing and coordinating all those activities—be it health department or other department. So coordination is there with other departments (E6, 12 Feb 2015).*

As I will demonstrate in the next chapter on Leptospirosis, and discuss in more detail in chapter 8, Gujarat is different from Tamil Nadu in many ways. However, both share a similar administrative structure and traditions.

Communication channels are explicitly identified in the case of avian influenza outbreaks. The established guidelines, as well as the direct interest of the department leadership in a major disease outbreak, ensure that communication lines are maintained at all levels. However, the same level of urgency is absent in the case of localised, self-limiting

outbreaks like anthrax. In the absence of administrative cover from either established protocols or bureaucratic leadership, it is quite possible that the officer felt more comfortable sharing information through informal channels. This would ensure the word gets out without anyone overstepping departmental boundaries.

5.7 CONCLUSIONS

In summary, within this chapter I examined the different ways in which a zoonotic disease like anthrax is understood, how responses are conceptualised and the effect of these understandings in influencing the collaborations around the disease.

I draw upon insights from scholars of policy analysis and science studies to analyse the role of politics in conceptualising scientific authority, in interpreting scientific knowledge, and finally, in shaping practices.

While anthrax is seen as a potential biological weapon in some contexts, others refer to it as a disease of poverty. And, given its association with communities handling carcasses in India, it is also associated with 'unhygienic' practices. These differences in understandings of the disease, and the diseased, in turn, shaped how disease control was practised.

There was a reluctance among some of the uncompensated, uninsured farmers not to let the meat go waste, on one hand, while on the other, among the team of visiting public health experts, the risks associated with the disease outbreak, and even more so with the potential for political fallout from the outbreak, merited distributing antibiotics to everyone exposed in the village for a two-month period. The public health team claimed to cite multiple sources of scientific authority to select an intervention, but ultimately, cited political exigencies as the over-riding rationale for their decision.

Lastly, I described the diffused and delegated nature of inter-sectoral collaborations that exists at the district level and which is characterised more by informal communications than a top-down institutional mechanism, demonstrating how the everyday practices within bureaucracies can provide the conditions for collaboration, even if formal policies do not.

6 LEPTOSPIROSIS

I had not originally planned to focus upon leptospirosis as a zoonosis. Like many other public health professionals, I did not know much about the disease apart from hearing about its periodic mentions following an urban flooding (ProMED-Mail, 2006, 1997; Rediff.com, 2005).

However, as a result of a set of fortuitous circumstances that I will explain shortly, I came to select the disease as one of my case studies. I was encouraged by state officers in Gujarat to study the disease as a 'success story' because of the way its initial outbreaks had brought together a range of stakeholders from different institutions who together developed a response strategy that is still in place. While I found this to be largely true, after spending more time in the field, a more nuanced, and a far more interesting, picture of the disease started to emerge.

Even as the disease has assumed an endemic status in Gujarat, and has been normalised, and even as state officers claim leptospirosis control to be a 'best practice', uncertainty and anxiety persist regarding the nature of the disease as well as the impact of its control strategy. In some ways, leptospirosis typifies neglected tropical diseases (NTDs) which, despite their very real presence, remain removed from popular imagination. Leptosporosis also provided me with a unique lens with which to view how popular perceptions and policy discourses are built and change over time. The officially promoted and overarching storyline about the disease revolved around how it was 'successfully controlled' and, indeed, was a 'best practice' of zoonoses collaboration. But on closer examination, and through deeper conversations with the respondents, it was clear that controlling the disease was a challenge.

As described in chapter 3, I interviewed the decision-makers and programme managers from different sectors who had different roles in disease control programmes. Not surprisingly, they expressed a range of opinions about leptospirosis control, depending upon their involvement in the disease control programme. Echoing insights from other zoonoses from my research, I will use the example of leptospirosis to illustrate the importance placed by decision-makers on generating narratives of success, and appearing to be in control, even in conditions of uncertainty and complex policy challenges, often using access to information for privileging certain narratives over others. These concerns, in turn, informed the extent to which intersectoral collaborations were allowed to develop and function around leptospirosis prevention and control.

6.1 BACKGROUND

As already noted, my own previous exposure to leptospirosis was limited to reading reports of the disease following flash floods in different parts of India (Jena et al., 2004; Zaki and Shanbag, 2010). In fact, as mentioned earlier, leptospirosis was not the disease I had planned to focus upon initially. Instead, I wanted my inquiry to focus upon the much more visible threat of Crimean-Congo haemorrhagic fever (CCHF), a widely-reported and newly-emerged fatal viral infection that first appeared in Gujarat just a few years ago in 2011 (Mishra et al., 2011).

CCHF is understood to have high mortality, especially among the health professionals coming into contact with patients. The picture presented by CCHF was strongly reminiscent of the alarmist depictions of other viral haemorrhagic fevers such as Ebola and Lassa (Leach and Hewlett, 2010), and, within the local context, of the pneumonic plague outbreak in 1994 in the state of Gujarat (Sivaramakrishnan, 2010).

The presence of CCHF in India was identified by scientists from the National Institute of Virology who advised anti-tick measures for cattle, among other measures, to contain the spread of the disease. Feeling the existing solutions were not practical in the state, the veterinarians, working with entomologists, developed a way to apply a locally available insecticide in a simple but effective manner to the cattle, thus preventing further spread of the disease.

As the excited animal husbandry officers recounted to me, the public health department recognised the expertise available among the veterinarians and involved them in the discussion from the start. The state veterinary epidemiologist described to me the extent of the collaboration that included developing anti-tick and CCHF containment strategy together in the high-level working group chaired by the Principal Secretary, as well as utilising their existing partnership with farmers in affected communities to deliver anti-CCHF measures along with the public health department. However, despite the enticing subject material offered by CCHF, my principal contacts within the public health and animal husbandry departments in Gujarat did not seem too keen for me to pursue this line of enquiry. Instead, they nudged me to explore leptospirosis which, they justified, would make a better case study for me as it had been brought under control as a result of well-established preventive and intervention measures in place.

In separate discussions (incidentally held on the same morning, and therefore implying a level of collaboration from both departments), officers from both the departments of Animal Husbandry (DAH) and Health Services (DHS) referred to several decades' worth of

work conducted on leptospirosis control in Gujarat and tried to convince me of its potential as a 'One Health case study'.

The sudden nature of CCHF resulted in reactive *"responses which might not have been as systematic and comprehensive"* as they could have been, one of the officers suggested, possibly implying that this is not the disease they wanted to showcase to the rest of the world. Leptospirosis, on the other hand, had been around for several decades and, consequently, had "*more mileage*"—Indian-speak for potential for publicity. The long-standing collaborations around the disease, officials suggested, pointed towards a '*best-practice*' of collaborations and therefore might make for a '*more informative*' case study for me (Field notes, 10 Aug 2016).

In the same set of conversations, I was also promised full support from the state government in gaining access for conducting my interviews around leptospirosis (no one seemed similarly bothered about brucellosis, my other disease case in the state). While I had been interested in CCHF because of its topicality, I did not protest too much about changing my disease selection. Leptospirosis met my criteria of an outbreak-prone disease quite well and, as had been pointed out to me, was likely to yield richer history of intersectoral collaborations dating from before the current discussions around emerging infections and before One Health gained currency. Securing access to key informants is relevant to conducting elite research (Goldstein, 2002), So, the assurance of access to state officers was as important for me as was the unsaid implication of limiting my access had I pursued CCHF.

6.2 DISEASE CHARACTERISTICS

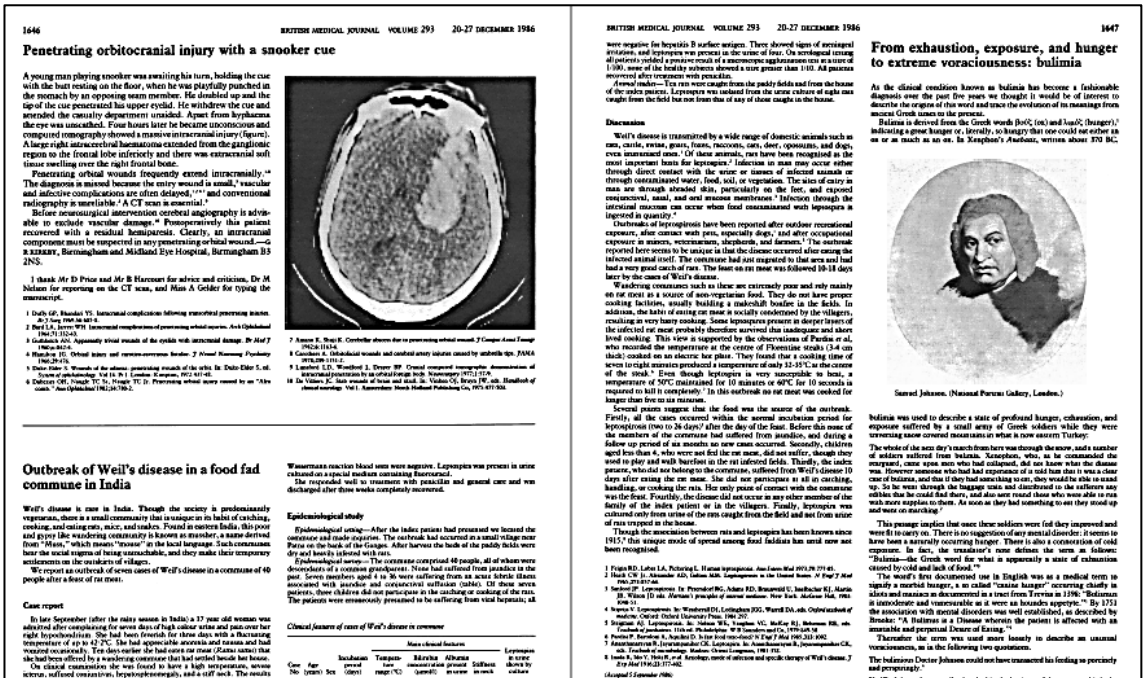
As I started exploring the literature around leptospirosis more intensively, I realised the many ways in which leptospirosis is representative of a typical zoonotic disease. It has a huge but unaddressed disease burden, mostly in tropical and resource poor countries and in underserved populations (Hotez, 2008a; Hotez et al., 2008; Lobo et al., 2011). It is believed that the disease results in at least 60,000 deaths annually from more than a million cases, but the burden of leptospirosis continues to be underestimated and, according to epidemiologists, is marked by an "*interaction of poverty, geography, and climate*" (Picardeau, 2015, p. 1).

The disease is primarily transmitted through infected rodents; it also affects, and is possibly transmitted, by livestock. However, the focus of epidemiologists and government remains on studying and controlling the disease among human populations (Tilahun et al., 2013; WHO and International Leptospirosis Society, 2003).

Leptospirosis in India

Indian epidemiologists had known about the disease through small, isolated outbreaks around the Indian coastline and the Andaman Islands in the Indian Ocean from the early 20th century; even before *Leptospira*, the causative bacteria, was discovered (Rao et al., 2003; Vijayachari et al., 2015). A defining feature of leptospirosis the world over has been that, even in places identified as being disease-endemic, its burden is largely underestimated (Halliday et al., 2015). It is usually when a population-based surveillance system is put in place as in the case of Kerala (John et al., 2004) or Orissa (Jena et al., 2004) in India, or when the disease is systematically studied (Crump et al., 2013) that leptospirosis starts becoming more visible.

Not surprisingly, while the disease is frequently identified in public health emergencies, it is not recognised (or reported) as commonly by clinicians in routine practice. A series of papers published in the 1980s provide a fascinating illustration of the way tropical diseases like leptospirosis are sometimes discussed within scientific communities.



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Penetrating orbitocranial injury with a snooker cue

A young man playing snooker was awaiting his turn, holding the cue with the butt resting on the floor, when he was playfully punched in the stomach by an opposing team member. He doubled up and the tip of the cue penetrated his upper eyelid. He withdrew the cue and seconded the casualty department unaided. Apart from hyphaema the eye was unscathed. Four hours later he became unconscious and computed tomography showed a massive intracranial injury (figure). A large right intracerebral haematoma extended from the ganglionic region to the frontal lobe inferiorly and there was extracranial soft tissue swelling over the right frontal bone.

Penetrating orbital wounds frequently extend intracranially.[1] The diagnosis is missed because the entry wound is small,[2] vascular and infective complications are often delayed,[3][4] and conventional radiography is unreliable.[5] A CT scan is essential.[6]

Before neurosurgical intervention cerebral angiography is advisable to exclude vascular damage.[6] Postoperatively this patient recovered with a residual hemiparesis. Clearly, an intracranial component must be suspected in any penetrating orbital wound.—G R KERRY, Birmingham and Midland Eye Hospital, Birmingham B3 2NS.

I thank Mr D Price and Mr B Harcourt for advice and criticism, Dr M Nielsen for reporting on the CT scan, and Miss A Gelder for typing the manuscript.

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Outbreak of Weil's disease in a food fad commune in India

Weil's disease is rare in India. Though the society is predominantly vegetarian, there is a small community that is unique in its habit of catching, cooking, and eating rats, mice, and snakes. Found in eastern India, this poor and gypsy like wandering community is known as musahar, a name derived from "Musa," which means "mouse" in the local language. Such communities bear the social stigma of being untouchable, and they make their temporary settlements on the outskirts of villages.

We report an outbreak of seven cases of Weil's disease in a commune of 40 people after a feast of rat meat.

Case report

In late September (after the rainy season in India) a 37 year old woman was admitted after complaining for seven days of high colour urine and pain over her right hypochondrium. She had been feverish for three days with a fluctuating temperature of up to 42·2°C. She had appreciable anorexia and nausea and had vomited occasionally. Ten days earlier she had eaten rat meat (*Rattus rattus*) that she had been offered by a wandering commune that had settled beside her house.

On clinical examination she was found to have a high temperature, severe icterus, suffused conjunctivae, hepatosplenomegaly, and a stiff neck. The results of investigations showed: white cell count $30·4 \times 10^9$/l with 90% polymorphs, bilirubin 135 μmol/l (7·9 mg/100 ml), alanine aminotransferase 400 IU/l, alkaline phosphatase 21·0 KA/dl, creatinine 106 μmol/l (1·2 mg/100 ml), sodium 140 mmol (mEq)/l, and potassium 4·2 mmol (mEq)/l. The results of routine urine examination showed albuminuria and the presence of bile salts and bile pigments. Cerebrospinal fluid contained protein 0·5 g/l, glucose 2·4 mmol/l (44 mg/100 ml), and white cells 25×10^6/l with 80% lymphocytes. No malaria parasites or Leishman-Donovan bodies were found in thick or thin blood smears. Urine culture showed no growth. Results of Venereal Disease Research Laboratory and Wassermann reaction blood tests were negative. Leptospira was present in urine cultured on a special medium containing fluorouracil.

She responded well to treatment with penicillin and general care and was discharged after three weeks completely recovered.

Epidemiological study

Epidemiological setting—After the index patient had presumed we located the commune and made enquiries. The outbreak had occurred in a small village near Patna on the bank of the Ganges. After harvest the beds of the paddy fields were dry and heavily infested with rats.

Epidemiological survey—The commune comprised 40 people, all of whom were descendants of a common grandparent. None had suffered from jaundice in the past. Seven members aged 4 to 36 were suffering from an acute febrile illness associated with jaundice and conjunctival suffusion (table). Of these seven patients, three children did not participate in the catching or cooking of the rats. The patients were erroneously presumed to be suffering from viral hepatitis; all

Clinical features of cases of Weil's disease in commune

Case No	Age (years)	Sex	Incubation period (days)	Temperature (°C)	Bilirubin concentration (μmol/l)	Albumin in urine	Suffusion	Leptospira in urine shown by culture
				More common features				
1	18	M	10	38·5-40·0	88·0	+++	Yes	Yes
2	36	M	10	38·2-39·0	119·7	+	No	No
3	12	M	12	38·3-39·4	66·7	++	Yes	Yes
4	5	M	12	38·5-39·4	70·5	Trace	Yes	No
5	28	M	10	37·2-39·0	74·0	++	Yes	No
6	29	M	13	37·5-40·0	69·6	+	Yes	No
7	9	M	10	37·8-40·0	87·5	+++	No	Yes

Conversions: ST to mol/l: bilirubin 1 μmol/l = 0·06 mg/100 ml.

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were negative for hepatitis B surface antigen. There showed signs of meningeal irritation, and leptospira was present in the urine of four. On serological testing all patients yielded a positive result of a macroscopic agglutination test at a titre of 1/100, none of the healthy subjects showed a titre greater than 1/10. All patients recovered after treatment with penicillin.

Animal studies—Ten rats were caught from the paddy fields and from the house of the index patient. Leptospira was isolated from the urine culture of eight rats caught from the field but not from that of any of those caught in the house.

Discussion

Weil's disease is transmitted by a wide range of domestic animals such as rats, cattle, swine, goats, foxes, raccoons, cats, deer, opossums, and dogs, even marsupial ones.[1] Of these animals, rats have been recognised as the most important hosts for leptospira.[2] Infection in man may occur either through direct contact with the urine or tissues of infected animals or through contaminated water, food, soil, or vegetation. The sites of entry in man are through abraded skin, particularly on the feet, and exposed conjunctival, nasal, and oral mucous membranes.[3] Infection through the intestinal mucosa can occur when food contaminated with leptospira is ingested in quantity.[4]

Outbreaks of leptospirosis have been reported after outdoor recreational exposure, after contact with pets, especially dogs,[5] and after occupational exposure in miners, veterinarians, shepherds, and farmers.[1] The outbreak reported here seems to be unique in that the disease occurred after eating the infected animal itself. The commune had just migrated to that area and had had a very good catch of rats. The feast on rat meat was followed 10-18 days later by the cases of Weil's disease.

Wandering communes such as these are extremely poor and rely mainly on rat meat as a source of non-vegetarian food. They do not have proper cooking facilities, usually building a makeshift hearth in the fields. In addition, the habit of eating rat meat is socially condemned by the villagers, resulting in very hurry cooking. Some leptospira present in deeper tissues of the infected rat meat probably therefore survived this inadequate and short lived cooking. This view is supported by the observations of Pardias *et al*, who recorded the temperature at the centre of Phoenician steaks (3-4 cm thick) cooked on an electric hot plate. They found that a cooking time of seven to eight minutes produced a temperature of only 32-35°C at the centre of the steak.[6] Even though leptospira is very susceptible to heat, a temperature of 50°C (maintained for 10 minutes or 60°C for 10 seconds is required to kill it completely.[7] In this outbreak no rat meat was cooked for longer than five to six minutes.

Several points suggest that the food was the source of the outbreak. Firstly, all the cases occurred within the normal incubation period for leptospirosis (two to 26 days)[1] after the day of the feast. Before this none of the members of the commune had suffered from jaundice, and during a follow up period of six months no new cases occurred. Secondly, children aged less than 4, who were not fed the rat meat, did not suffer, though they used to play and walk barefoot in the rat infested fields. Thirdly, the index patient, who did not belong to the commune, suffered from Weil's disease 10 days after eating the rat meat. She did not participate at all in catching, handling, or cooking the rats. Her only point of contact with the commune was the feast. Fourthly, the disease did not occur in any other member of the family of the index patient or in the villagers. Finally, leptospira was cultured only from urine of the rats caught from the field and not from urine of rats trapped in the house.

Though the association between rats and leptospira has been known since 1915,[2] the unique mode of spread among food faddists has until now not been recognised.

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From exhaustion, exposure, and hunger to extreme voraciousness: bulimia

As the clinical condition known as bulimia has become a fashionable diagnosis over the past five years we thought it would be of interest to describe the origins of this word and trace the evolution of its meanings from ancient Greek times to the present.

Bulimia is derived from the Greek words βοῦς (ox) and λιμός (hunger),[1] indicating a great hunger or, literally, so hungry that one could eat either an ox or as much as an ox. In Xenophon's *Anabasis*, written about 370 BC,

Samuel Johnson. (National Portrait Gallery, London.)

bulimia was used to describe a state of profound hunger, exhaustion, and exposure suffered by a small army of Greek soldiers while they were traversing snow covered mountains in what is now eastern Turkey:

The whole of the next day's march from here was through the snow, and a number of soldiers suffered from bulimia. Xenophon, who, as he commanded the rearguard, came upon men who had collapsed, did not know what the disease was. However someone who had had experience of a mild bout than it was a clear case of bulimia, and that if they had something to eat, they would be able to stand up. So he went through the baggage units and distributed to the sufferers any edibles that he could find there, and also sent round those who were able to run with more supplies to them. As soon as they had something to eat they stood up and went on marching.[2]

This passage implies that once these soldiers were fed they improved and were fit to carry on. There is no suggestion of any mental disorder: it seems to have been a naturally occurring hunger. There is also a connotation of cold exposure. In fact, the translator's note defines the term as follows: "Bulimia—the Greek word for what is apparently a state of exhaustion caused by cold and lack of food."[3]

The word's first documented use in English was as a medical term to signify a morbid hunger, s as called "canine hunger" occurring chiefly in idiots and maniacs as documented in a tract from Trevisa in 1398: "Bolismus is immoderate and unreasonable as it were an hounds appetyte."[4] By 1751 the association with mental disorders was well established, as described by Brooke: "A Bulimus is a Disease wherein the patient is affected with an insatiable and perpetual Desire of Eating."[5]

Thereafter the term was used more loosely to describe an unusual voraciousness, as in the following two quotations.

The bulimious Doctor Johnson could not have enamored his feeding as precisely and perspicuity.[6]

He [Dr Johnson] was totally absorbed in the business of the moment; his looks seemed riveted to his plate; nor would he unless in very high company, say one word, or even pay the least attention to what was said by others, till he had satisfied his appetite, which was so fierce, and indulged with such intemperate, that while in the act of eating, the veins of his forehead swelled and generally a strong perspiration was visible.[7]

Thus, probably entirely due to Dr Johnson's prodigal gluttony for food, bulimia has come to mean extreme voraciousness.

Figure 17: Case report on leptospirosis published in the BMJ (Agrawal and Srivastava, 1986, pp. 1646–7)

Agrawal and Srivastava (1986) describe a 'case' of outbreak of leptospirosis in a 'food-fad commune', an oblique reference to a marginalised community called '*Musahar*' (literally meaning rat-eaters in Hindi) in the eastern Indian state of Bihar, who are known to eat rats in times of food scarcity. The patronising generalisation and sloppy epidemiology of

the report attracted comment from another doctor, originally from the same state in India. He punched holes in the epidemiological and social analysis of the case report by identifying several alternative explanations for the disease apart from consuming rat meat (Singh, 1987).

The well-regarded *British Medical Journal* published the case report, tellingly sandwiched between eye-catching reports of an eyeball injury from snooker and another report on bulimia featuring a portrait of Samuel Johnson (Figure 17). It can be argued that labelling the Musahar camp as a 'food-fad commune' would be one way to make leptospirosis sound exotic enough to merit featuring in the journal.

Leptospirosis in Gujarat

As is the case with most states lining the Indian coastline, leptospirosis is now known to be endemic in coastal regions of south Gujarat (Figure 18). However, it had not been formally reported in Gujarat before an outbreak associated with high mortality occurred in Valsad in 1994, which subsequently spread to neighbouring districts and caused a major outbreak in 1997 in the commercially important district of Surat (Patel et al., 2006; Prasad, 2000). Since then, leptospirosis outbreaks have become an annual occurrence.

Figure 18: Map of Gujarat with Surat identified. (Source: Wikipedia)

Significantly, 1994 was also the year when an outbreak of bubonic plague took place in Surat. This was a watershed year for public health planning in Gujarat as also across India.

The outbreak and its aftermath exposed poor urban sanitation, weak public health response and limited surveillance and response capacities of the Indian state. It occurred at a time when India was opening up its economy. Surat prided itself for its place in the international economy.[35] The plague outbreak resulted in losses of billions of dollars in trade nationally as airplanes were fumigated or even returned from international airports and led to a major loss of face (Garrett, 2000; Sivaramakrishnan, 2011).

The episode eventually led to a comprehensive review of national public health surveillance systems chaired by David Heymann of WHO and the development of a national disease surveillance system that still serves as the backbone of public health preparedness and response in the country (Abbas, 2012). The levels of anxiety and migration witnessed during the plague outbreak still form a part of the institutional memory of the public health machinery in Gujarat.

The fact that the first outbreaks of leptospirosis followed soon after plague and floods of 1994 in Surat district, and incidentally both involving rats as a major reservoir (Patel et al., 2006), possibly served to galvanise the response from an already sensitised public health machinery. In fact, as is implied in the quote below, it is quite possible that leptospirosis was discovered in the region only because of the heightened surveillance instituted in the region in 1994. In his ethnographic study of leptospirosis outbreaks in the region, Prasad (2000, p. 3689) quotes a doctor from the district who claimed that:

> *There were lepto cases in Surat district even prior to 1994 but got bypassed. It was only during the plague in Surat, that Leptospira were detected through cultures in the laboratory tests.*

While in 1994, the focus of public health authorities was on controlling the plague outbreak, given the international spotlight placed on the city, subsequent outbreaks of leptospirosis in 1997 and 1998 provided them with an urgency to understand the disease spread and develop a response strategy. Studies conducted by local clinical researchers point to the unique manifestation of leptospirosis in Surat. From around 2006 onwards, patients with leptospirosis in Surat presented with higher and severe form of respiratory symptoms, many of them requiring access to ventilators (Shah et al., 2012). An ethnographic survey conducted by Prasad (2000) pointed out the high proportion of tribal populations in leptospirosis-affected areas in Surat. A paper from the state public health department demonstrated the spread of leptospirosis from rural to urban areas and to

[35] According to Surat Municipal website (https://www.suratmunicipal.gov.in/TheCity/Contribution, accessed 3 Oct, 2017), the city accounts for 42% of the world's total rough diamond cutting and polishing, and 12% of Indian fabric production.

neighbouring districts over a number of years (Patel et al., 2006). Epidemiological studies by the public health department, such as those by Bhardwaj et al.(2008), identified contact with flood water, walking barefoot and presence of rats in the area as key risk factors associated with the disease.

Investigating the role of animals in disease transmission does not appear to have been the focus in the initial years of the outbreak. However, possibly following the establishment of several veterinary schools in the region afterwards, I found recent studies that have documented the exposure levels of different animal species to leptospirosis. Sero-prevalence studies by Panwala et al. (2015, p. 11) demonstrated a 40% carrier rate in cattle in the region, a finding echoed in other studies by Patel et al. (2014; 2015) and Balakrishnan (2011).

As the medical community in Surat subsequently realised, leptospirosis was now widespread in south Gujarat region and most people were at risk of exposure to the disease following the monsoon. Therefore, the response strategy for the disease now had to focus on promoting availability and early access to adequate health care services.

The next section examines how different agencies came together in Surat to develop their collective understanding of the disease situation and used that to develop a response strategy, as referred to in Figure 19 and explained below.

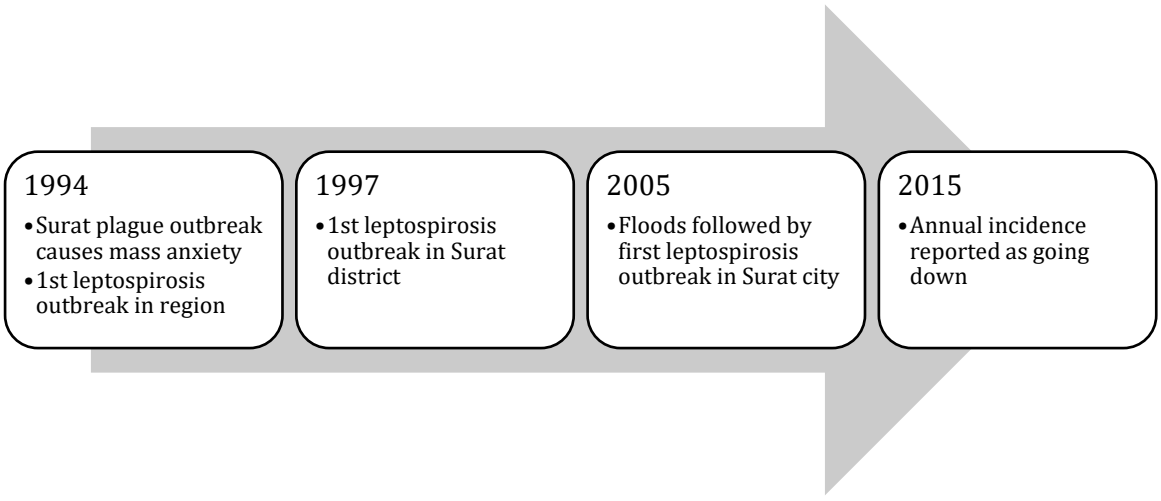

Figure 19: A timeline of leptospirosis in Surat.

6.3 RESPONDING TO DISEASE

Arriving in the immediate aftermath of the disastrous 1994 plague outbreak in Surat, the disease took everyone by surprise. Under political pressure, the local administration as well as the faculty from Surat medical school were determined not to let the disease go out

of hand as had happened in the case of plague, and which had resulted in the loss of image for the commercially important city.

At the time of the outbreak in the mid 90s, district health offices did not have the personnel and material resources they enjoy now. There was no disease surveillance programme with formal disease reporting and response mechanisms. Moreover, the disease was as yet little understood by researchers and programme officers alike in Gujarat. Therefore, faculty from the departments of Medicine, Microbiology and Community Medicine of the local medical school were engaged from the very initial outbreaks for their expertise, as described by a programme manager in local public health department:

> *And since around 1998 or '99 —exact(ly) I don't know. But from '97-'98, or from '99, in Surat, surveillance for leptospirosis was started. And at that time, it was in infant stage—meaning surveillance was being developed. So slowly, slowly…in terms of experience we started surveillance. And as time went by we felt that this thing needs to be done. So in around 2005, our full-fledged programme, as you say, (started). So there was no aspect left in it. It became like this.*
>
> *Every year, one activity more used to be there in surveillance. If there was anything left to be done then ok, one more year it was extended, so during that second year, something else was added, in the third year something else was added. In 2005, GMC, the Government Medical College which is there over here...a module was made (D10, 9 Feb 2016).*

While most medical schools in India have traditionally not engaged directly with public health programmes, the case of the public health department of Surat medical college was a little different. A relatively newly established medical school, Government Medical College (GMC), Surat had been active in government health programmes even before leptospirosis, as explained by a former member of Community Medicine department in the GMC:

> *We had learned a lot—a number of diseases which other communities and departments had not even heard of. But we could also have done that without entering into (health programmes) and it's not a mandate for us. We are a teaching institution.*
>
> *But how can you teach when you don't know what is happening around you. That is one and second is you are sitting there as a public health expert and if you don't contribute to the crisis then what sort of public health expert you are? That was my understanding…. And that's why we used to work for any health crisis which used to come to us in Surat and south Gujarat. And probably that's why my department was considered top-most in India (D16, 9 Feb 2-16).*

At the time of leptospirosis outbreak in 2006, a senior public health professor from the college was deputed to the ministry to manage public health programmes. Building on the

previous experience and institutional links, different departments of the medical college were involved in responding and controlling the outbreak from the beginning. While the epidemiologists and microbiologists helped collect data and tried to assess the extent of the problem, physicians from the department of medicine were deputed to smaller hospitals in the district during the outbreak season every year for managing patients.

> *But then investigation facilities were built up. In early phases even government institutions had a shortage of dialysis machines and other things. So we had even done public-private partnership—a contract to manage the cases which were in need of dialysis in Surat city in private hospitals (D16, 9 Feb 2016).*

The presentation of the disease in Surat was much more severe than those reported from the southern states in India that had a longer history of the disease. Many of the patients in Surat required services of a ventilator, as well as access to intensive care specialists, which were unavailable in most public hospitals at the time. Therefore, even as microbiologists developed diagnostic kits that were effective against the local strains, the faculty from internal medicine were deputed on short postings to cover management of suspect cases in peripheral hospitals and train the doctors there.

As a result of intense scrutiny of the local public health response during the 1994 plague outbreak in Surat, a basic surveillance system had started being discussed following an outbreak of leptospirosis in rural Surat in 1997. However, it was still seen as a distant problem and very much an unknown disease:

> *(In) 2006, we were ignorant that there can be leptospirosis in the city (D16, 9 Feb 2016).*

Surat city faced a major flood in 2006, which brought in its wake the first outbreak of leptospirosis in the city. Not surprisingly, this made people immediately recall the last major outbreak in the city, in the words of a local public health physician:

> *First case was in a private hospital. Midnight I got a phone call – "I've got a case and should I transfer to city hospital or I can continue to manage?" I said keep a sample for us and you can manage the case. Next day morning, we all sat together and decided the protocol for private institutions. What are the diagnostic criteria and what they are supposed to do, how they are supposed to report…. Then along with IMA (Indian Medical Association) we prepared community education message.*
>
> *So it was Saturday-Sunday, so I was here. And I was also held up (in Surat) because of traffic. And maybe I took 18 hours to clean my own house...and travel up to Civil Hospital after those 18 hours and...for one week, I was facing even international media, just replying whether there's likely to be plague outbreak in the city or not.*

> *And nobody thought of leptospirosis. And because post-plague Surat has continued the...rat surveillance...and flea surveillance...we had some confident clues whether there will be plague or not. And I used to say as, as per today's surveillance data, it's not likely (D16, 9 Feb 2016).*

Lack of institutional expertise in the disease, coupled with an escalating number of villages and people affected in the annual disease outbreaks, was likely to have increased pressure on the government for developing an effective response strategy, especially when the memories of the chaos exposed by the plague outbreak must have been fresh in public mind.

Local academia-practice collaborations

This prompted the local public health agencies to approach the faculty at Surat-based GMC for technical assistance. As recounted by a public health officer:

> *In medical education, the PSM department and our...medicine department and paediatric department, they used to support us. So mostly from the PSM[36] department we used to take an expert with us and from here we used to have our experts and our field officers used to be there. All of us together, we used to have a meeting (D10, 9Feb, 2016).*

According to a public health academic:

> *Any crisis which comes in south Gujarat, we work voluntarily for that. That was the mandate for us. Because that is an opportunity for entire hierarchy of the department to learn about epidemics and how to manage and how to contribute and that may be...it's our business to handle the data and everything and leave and even connect the departments or build up a network... (D16, 9 Feb 2016).*

The public health officers and epidemiologists involved in the initial years of leptospirosis outbreaks were quite candid in explaining how they were taken by surprise because of the relative novelty (and severity) of the disease, and how they had to develop their own understandings very quickly.

> *So some literature, when someone is in the PSM department, someone is in medicine, so all new, because all these were new things no, so all used to take an interest... (D10, 9 Feb 2016).*

The collaborative team of academics and programme managers, primarily from within the health sector, produced a set of guidelines for responding to leptospirosis that they refined several times. The operational guidelines included information useful for district public health workforce in carrying out different tasks of outbreak response. This included case definitions to be used in the field, clinic and laboratory, methods for sample collection and

[36] PSM stands for the Department of Preventive & Social Medicine, the closest academic discipline to public health taught in medical schools in India. More recently, it is also referred to sometimes as Community Medicine.

transport, description of basic epidemiology and clinical manifestations of leptospirosis as well as protocols for clinical management.

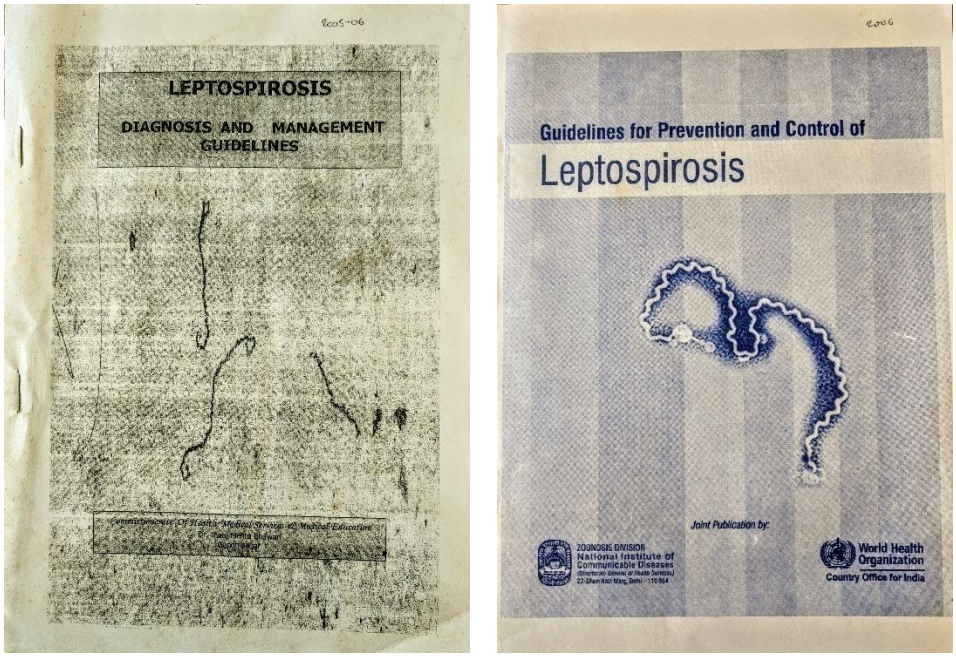

Figure 20: 2006 Leptospirosis manuals by GMC Surat (left) & NCDC (right).

According to some individuals involved in the process, the visiting team of 'experts' from the NCDC[37] was so impressed with the manual that they promptly repackaged the content and published it with their own institution's logo (Zoonosis Division - NICD, 2006). I heard this story many times, recollected by different people who had participated in the discussions with NCDC in 2006. I interpreted this recollection both as a form of validation of the rigour of their efforts, and possibly out of frustration at the denial of intellectual credit for their efforts (Figure 20).

> *In 2005, GMC prepared a manual, meaning written guidelines were made. Like that, little bit of guidelines were made but some used to be made on the treatment aspect, or how the surveillance will work. But complete, comprehensive guidelines were made in 2005. Then later, the state government approved it.*
>
> *Then in 2006 or in '07, NC...at that time NCDC people also used to come here...to give expert opinion during this episode. Sometimes we used to call their team also to do research - NCDC Delhi. So those who used to come from Delhi, they took these guidelines. They modified it a bit, put in their own inputs, and presented these guidelines at the national level (D10, 9 Feb 2016).*

As discussed in the document, this feeling is likely to have been further accentuated by the fact that, despite several post-graduate theses and different sets of research studies

[37] then referred to by its old name, National Institute of Communicable Diseases (NICD)

conducted over the years, the Surat academics have been prevented from publishing their findings emanating from the data which is 'owned' by the state government.

The public health faculty from the medical school worked with local public health agencies to develop a better understanding of the disease epidemiology and assist in investigating disease outbreaks. It is a testament to the enthusiasm and capabilities of the faculty at Surat medical school that until a few years ago, all leptospirosis investigation cases were conducted at the medical school and their epidemiologists managed the local disease database. Now a lot of diagnosis takes place in peripheral hospitals, as does the clinical management of suspect patients.

To summarise, it seems that the district administration was taken by surprise by the 2006 outbreak hitting Surat city. Not wanting a repeat of the anxiety levels seen in 1994, and because of the limitations of knowledge around the disease in the area, as well as the availability of a willing and capable partner, helped in the development of an informal cooperation between the local administration, health department and the medical college aimed at controlling the disease. However, the visibility of the disease among the human population and the expertise of the local actors ensured that the collaboration would be human-centric in its focus and would not emphasise the zoonotic component of the disease.

Case definitions

Case definitions for leptospirosis surveillance were revised frequently making year-on-year comparisons of disease incidence quite difficult. I found the disease trends, depicted in Figure 21, using surveillance data collated from the public health office in Surat. It shows the annual incidence of leptospirosis cases ranging from 2-390, having come down markedly in recent years. The disease severity (or case fatality rate) showed similar fluctuations, but generally hovered between 15% and 20%. Curiously, the disease incidence data does not correlate with 1994, 2005 and 2013—the three years when major floods occurred in Surat—nor with reported figures in other publications[38], which does lead one to question its accuracy.

[38] For instance, the famous 2005-06 outbreak is supposed to have resulted in 379 suspected cases and 43 fatalities, as cited in (Parmar et al., 2013, p. 507)

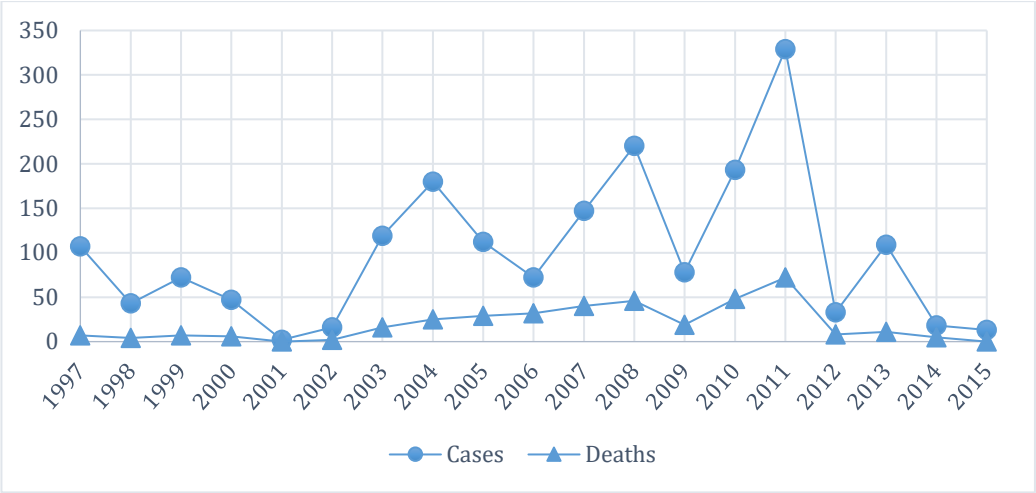

Figure 21: Incidence of human leptospirosis in Surat district (1997 - 2012)[39]

Leptospirosis was a new disease for the local public health community and it took some time for them to put in place a surveillance and response strategy after the initial outbreak in 1994. As the public health officers struggled to come to terms with the disease, they invited participation from the faculty of GMC, Surat to help them mount a response.

The surveillance system started working in 1997, and gradually increased its coverage to cover all the reporting units in Surat in 2004, possibly accounting for the peak in the above graph, as explained by a senior public health researcher to me:

> *First official data comes out…roughly around 94…94-98 actually started. But the peak was somewhere around 2004. But that was mainly because of the increase in the surveillance net (E3, 21 Aug 2015).*

However, the disease trends in later years became even harder to interpret, most likely because of the differences in defining leptospirosis cases in successive years. As a few public health academics associated with designing the response strategy in the early years recounted:

> *Our case definition was made so broad – we had made it such that any case, if it looks like… any such symptoms come up, then we used to any way take it as a suspected leptospirosis case. We used to talk about confirmed (case) later… Like that gradually, it was understood what leptospirosis is. At that time, people were scared because of this plague… (as it had also) happened post-flood (D10, 9 Feb 2016).*
>
> *The main difficulty…was because of the changes in (case) definition. Who can be a suspected or confirmed case of leptospirosis? Sometimes, they felt MAT test positive is lepto, or sometimes they said it's only ELISA that was positive, sometimes they said, it's the two ELISA, and second four-fold rise was a*

[39] Another district, Tapi, was carved out from the larger Surat in 2009. The data above exclude cases from areas currently included in the new district. Source: (Epidemic Branch (Surat)-Commissionerate of Health Family Welfare & Medical Services, 2016)

> *positive lepto, and sometimes they said only RTPCR cases can be termed as a confirmed case of leptospirosis.*
>
> *And within a year also I have seen instances where the kits were changed. So if I say now four-fold rise – in kit A, the four fold rise or the cut off for lepto was 4, so it became four-fold rise of 16. In the second kit that was (some word) by the government had cut off of 10, so it became 40, so there were issues regarding that also (E3, 21 Aug 2015).*

Untested remedies

As recounted by a public health researcher who was involved in the initial activities, the team tried different methods to understand disease epidemiology, and associated risk factors that could help them identify individuals at risk and develop interventions. While it is difficult to find any scholarly examination of these strategies in the published literature, the quote below gives a fascinating insight into the thinking that informed these initial activities:

Figure 22: Laboratory protocols for leptospirosis.

> *Most of them are poor, tribal, farm labourers. And farm labourers means they were not all employed by some family. Many of them had their own small land where they were working. And it was even very difficult to identify these farms...that the patient was exposed in which farm.*
>
> *Because the practice is, 'Today you help me in my small farm, tomorrow I come to your farm and help you'. And even their residence was just in the midst of the farm. So they have to cross that mud and everything daily when they come out.*

> *So, in that early phase we say it is predominantly amongst those who work in farm... but then argument started coming up – 'Oh, he was teacher. Oh, he was trainer. Oh, he was student'. But then you (realise), in such villages even a teacher has to do some farming... of his own or at least has to cross the mud and slush and pass through it. The rats are not going to discriminate.*
>
> *So, it is only exposure which matters but then... occupation exposure rate is higher. Then when we looked, we also followed up cases in the field and that gave us lot of insight of their living condition and exposure risk and other things (D16, 9 Feb 2016).*

It was in these circumstances that the NCDC, during one of its meetings with the leptospirosis team in Surat, suggested the introduction of chemoprophylaxis, which involves the mass distribution of doxycycline, to the entire population in selected villages. Doxycycline, similar to ciprofloxacin discussed in the previous chapter on anthrax, is a broad-spectrum antibiotic. It is the treatment of choice for a wide range of pathogens, despite increasing resistance. Doxycycline can also be harmful to children, babies and those with other existing illnesses (British National Formulary, 2018; Bryant et al., 1987).

There is limited evidence that supports mass distribution of such a powerful antibiotic as doxycycline for leptospirosis. At the time, the suggestion must have been made by NCDC when there would have been only one study available in the public domain. Sehgal et al.'s (2000) study was the only clinical trial at the time from India which failed to detect any impact on infection levels, though it did demonstrate potential for reducing disease severity.

When I probed the public health experts associated with the decision in Surat, I got a response along the following lines from all of them:

> *When such critical cases appear, you can't say that this is not recommended, this is not done…. See there are, see then it is public health challenge and that too crisis like that, there needs to be visibility of programme.... People should feel that something is happening and there should be some effectiveness of it and science of intervention (D16, 9 Feb 2016).*

This justification seems to have a lot in common with the decision on anthrax discussed in the previous chapter. As demonstrated in the case of anthrax, this justification by the state seems to prioritise political expediency, or being seen to be doing something, over acknowledging the uncertainty and loss of control when it comes to the natural world.

Such reasoning presupposes that the 'public' lacks capacity for rational reasoning (Marsland, 2014). However, what I find ironical here is that, while on the one hand the government refused to engage with public in decision-making process citing lack of capacity, at the same time its officers appear to be using their technical expertise to justify a decision which was ultimately arrived at out of political expediency!

At least, among my interviewees who were familiar with the academic literature, there was widespread agreement about lack of scientific evidence regarding the effectiveness of chemoprophylaxis. And, I did not have to look too far to find scientific literature questioning the strategy.

In their joint review of the existing evidence base regarding leptospirosis, WHO and the International Leptospirosis Society (2003) suggest chemoprophylaxis in specific circumstances to exposed individuals only and not as a population level general intervention, as was practiced in Surat. Moreover, two systematic reviews published in Cochrane by Brett-Major and colleagues have cited unclear evidence on the use of antibiotics in prevention (2009) as well as treatment (2012) for leptospirosis. This means that both of the key strategies employed by the government could offer doubtful protection against leptospirosis.

This led me to wonder how a policy like this could sustain itself for more than a decade on such weak grounds with endorsement by locally-based actors, whose authority and credibility was invested in the programme. Even though 12 years had passed since the launch of the chemoprophylaxis strategy in Surat, perhaps it was telling that I was not able to find anyone in Gujarat willing to offer a strong defence. Could it be possible that the inputs for the policy have come from an institution outside the state, such as the NCDC or the Indian Council of Medical Research (ICMR), with different levels of ownership by local actors?

In fact, despite the restrictions on publishing, I could detect hints of quiet resistance to the policy by Surat-based academics and health officers. For instance, none of the state manuals on leptospirosis control that I came across[40]advocates chemoprophylaxis, even though it was listed in their calendar of annual activities.

The resistance from the academic side was much more explicit. I came across multiple papers from public health as well as microbiology researchers from GMC, Surat that questioned the chemoprophylaxis strategy. Some of them do so in very unambiguous terms, such as those entitled, "*Chemoprophylaxis with doxycycline in suspected epidemic of leptospirosis during floods: does this really work?*" (Bhardwaj et al., 2010) and "*Prophylaxis and treatment for leptospirosis: Where are the evidences?*" (Charan et al., 2012).

I must confess it took me a while to locate these papers. This was because very few of my interviewees cited these critical papers, possibly indicating that an aversion to

[40] I was able to access 2005, 2009, 2012 and 2013 versions of the operational manual on leptospirosis control, published by the Government of Gujarat.

commenting on public policy still persists. Another likely explanation for the continued silence on policy issues is that the Surat academics might have felt spoken over and outcompeted for credibility in comparison with national agencies. As the public health researcher responded to me when I probed the lack of publications from GMC:

> *They published series of books. And that's why we could not publish (D16, 9 Feb 2016).*

From evidence to policy

However, when I tried to examine the process and rationale for implementing chemoprophylaxis through the perspective of a middle-level programme manager, a slightly different and more messy explanation emerged, complicating the standard publics vs public health argument. I interviewed the public health officer responsible for implementing the daily activities of leptospirosis and other outbreak-prone diseases in Surat. This is what he said:

> *(Chemoprophylaxis has been going on) since 2005. Only one or two years we had dropped in the middle...in 2007 or '08.*
>
> *In 2005, we only started it in high risk talukas. Meaning they were selected talukas. After that, we increased it and... Barring only one or two talukas, where no cases used to happen during the whole season, in all the talukas this was implemented.*
>
> *After that, political problems started coming up. Meaning… in this (chemoprophylaxis program) there was a lot of political commitment. These cases used to happen in the tribal areas. And the tribal population is given a lot of importance now by the political people.*
>
> *So in the tribal area that, like if there was even one death... due to any reason whatsoever. For instance...a scattered case happened somewhere.... which is a non-endemic area...*
>
> *And what happens is that… over there (non-endemic area where the death occurred) we do (have) surveillance but there is no (distribution of) doxycycline… Then what happens is that over there the level of awareness meaning sensitivity which should be there...to detect the disease… is not there.*
>
> *So the case is also reported late and the doctor also doesn't take it too seriously. So what happens is that if that case goes on, there are more chances of deaths taking place. If death takes place over there...then there is a problem. Over there, each and every death was counted.*
>
> *If there is a death, then immediately questions will start. 20-25-30 (deaths) – why (did) this happen? Who had gone for chemoprophylaxis? Why wasn't it started? What, then to give answer brother (to the question) why isn't it (the chemoprophylaxis intervention being implemented) over there?*
>
> *Now the scientific reason, we can make the doctor understand. It is a little difficult to make a political person understand it....*

> *So they said, "*No, it should be started*". Then they said that "*It is ok (to start distributing antibiotics). If there is even one death that can be avoided over there, so what's the problem? Start it over there."*
>
> *Then we didn't leave any area.*
>
> *So we had started chemoprophylaxis in all the areas. But we ensured that we gave it (the antibiotics) to the high-risk population. Meaning the other population we don't (distribute the drugs to). Those who are field labourers...meaning those who are related to animal husbandry (are covered)...*
>
> *(So now we're covering all the areas, but) only high-risk population. Those who have chances of getting it. Those who have exposure. Those who don't have any exposure only there is no meaning to give them. (D10, 9 Feb 2016)*

The above quote highlights quite nicely the gap between motivations, incentives and the expectations of problem solving between academic and policy contexts. While the officer quoted above did not say so explicitly, I assume he was aware of the scientifically questionable premise of antibiotic prophylaxis. However, once the decision was taken to implement the policy (before his time, and likely above his paygrade) by technical experts and administrative leadership, they started doing so within endemic areas only, likely to maximise the benefits and reduce the risks and costs of the intervention.

How the strategy unfolded subsequently was quite illuminating. The officer acknowledged the limitations of surveillance and response systems, while explaining their inability to identify potential cases of leptospirosis and institute prompt treatment, especially in the relatively inaccessible, but politically significant, tribal communities.

He explained the political fallout of even non-disease-related deaths in the outbreak season. He found it difficult to respond to the intense scrutiny all of his department's actions would come under from the political leadership. Questions would be raised not only about the absence of chemoprophylaxis, but also about all other aspects of his department's strategy.

Rather than engaging with the political representatives in a reasoned debate (since "it is difficult to make a political person understand"), the path of least resistance for the public health officer was to cover the entire district, but focus on the most exposed (likely poorer) people.

As the discussion above highlights, government officers appear to have mixed feelings about the public and their representatives. Recalling Marsland's (2014) notion of publics as lacking capacity for rational thought, the public health officer clearly does not have confidence in the merits of his arguments and in his ability to convince the politician about the benefits of following the 'rational' strategy. Instead, the officer is clearly aware of the

hierarchy of influence and making sure that the interests of those with the most influence are accommodated in the official policy.

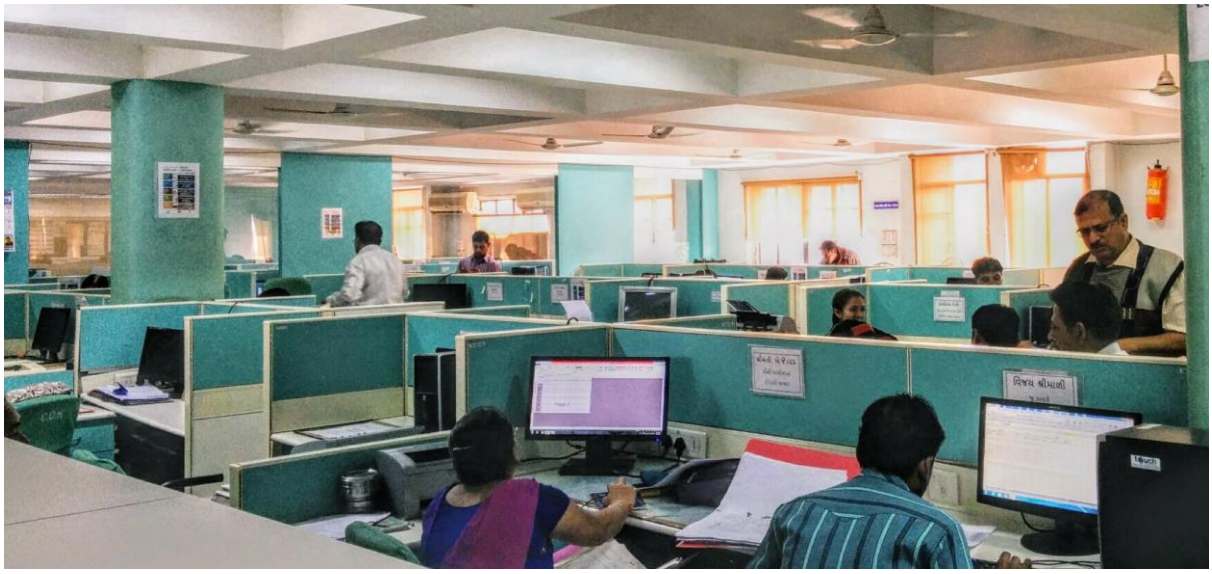

Figure 23: Control room mangers? Health dept, Govt of Gujarat.

Officers like these typically work at the interface of field personnel, policy-elites and political leadership. Therefore, it is up to the individuals like the quoted public health officer to identify policy options and negotiate a consensus among the political and bureaucratic stakeholders in order to seek endorsement. It will also be his/her job to ensure that this commitment to political goals is translated into a scientifically justifiable and practically acceptable intervention that could then be sold to the peripheral workforce as doable.

Simplistic linear frameworks of evidence-based decision making (Armstrong et al., 2006; Mansnerus, 2013) often do not do justice to the complex, messy realities of second best compromises that Roe (2016a) calls for in managing policy messes. There are definitely shades of Roe's (2013) high reliability professionals and control room managers (Figure 23) in the way officers like the one quoted above make decisions, as explained later in the chapter.

Multisector planning

> *First time in history…for leptospirosis, animal husbandry, agriculture department, public health department used to sit together in the year and plan for intervention and re-think what had happened in this case. That happened for the first time.*
>
> *And they used to exchange information, high-risk area, so that happened in early...in order to test problem. And one of the advantages of the plague was*

> *that it was a sensitive issue. So every department...used to feel that they have to be part of this. Because it's everybody's responsibility (D16, 9 Feb 2016).*

While the primary agencies involved in assessing and devising strategies for leptospirosis control were the public health department and the local medical college, other government departments such as animal husbandry, agriculture and the municipality were also involved in different ways. As discussed in the quotations from a public health researcher from Surat above and from a state veterinary epidemiologist below, veterinarians from animal husbandry are consulted while developing the annual calendar of activities for leptospirosis:

> *See, especially for leptospirosis control, the health department is tracking the needs. They are inviting every say...monsoon is coming in every year, so we have to prepare an action plan... and according to the prepared action plan, they will make a calendar.*
>
> *So the training will be held at district level, taluka level or at the medical college by inviting… stakeholders, veterinarians, farmers and all these people. So that time for leptospirosis, health department became the lead and called all the meetings with a certain agenda to be acted upon (E6, 10 Feb 2015).*

For a zoonotic disease that has been studied for more than two decades, there is surprisingly little understanding (or interest) in mapping the reservoir species, understanding their ecological dynamics and devising suitably tailored strategies. The only study conducted among animals at the time appears to have been by the microbiologists at the medical school (Panwala and Mulla, 2015) and two more descriptive studies by Patel (2014; 2015), which are limited to cattle and provide no solution to the problem. Taken together, they point to a constant presence of leptospirosis among livestock.

To date, I have not managed to come across any assessment of leptospirosis among rodent populations in Gujarat, despite the NCDC claim that "*it is established beyond doubt that rodents are the major reservoirs of bacterium Leptospira*" (Venkatesh et al., 2016, p. 78). This statement can be made only if the authors of the report had exclusive access to unpublished data, or if they were extrapolating evidence from another context to Surat.

The lack of rodent surveillance data is especially confusing in Surat because Surat is one of the few places in India having a regular rodent surveillance programme in place. Thanks to the plague outbreak, Surat is one of the few sites to have dedicated rodent surveillance teams in rural and urban areas funded through their municipality. The samples, however, have to be sent outside Gujarat for testing by the only national referral laboratory on plague run by NCDC in Bengaluru. The Gujarat officers, despite multiple requests, cannot get additional leptospirosis testing on rodents because the lab does not have the capacity

to do so. As recounted by the public health officer below, the frustration with the NCDC clearly shows through:

> *And...another thing is that a plague surveillance unit is available at our place, two of them... after 1994. So in the plague surveillance the problem used to be that, we have suggested 2-3 times to them, we suggested to NCDC also, either it was a political problem or they had a financial problem, I don't know. So we told them for plague, you are anyway taking the rodent organs.... You are taking the blood also for sampling. So in that only why don't you people do the leptospirosis sampling?*
>
> *So the NCDC team used to come here every year to look at leptospirosis. So we told them that you develop an additional facility for leptospirosis and in that you do something. Now, it is my personal thinking, I don't know whatever it is...but maybe they didn't have much interest in developing that centre, whatever it may be (D10, 09 Feb 2016).*

I was told that an annual plan of work is developed in advance every year to identify activities needed for leptospirosis control. Apparently, the plan is prepared by the public health department, which prepares an annual calendar of activities in consultation with animal husbandry and agriculture departments.

> *We have prepared Gantt charts of different sorts of activities, that (describes) how to go. State's task was getting (supplies), which month we are getting, identification of high risk areas, and identification of inter-department meeting. That inter-departmental meeting happens here (Health Commissioner's office) at the state-level as well, and regional level also (E7, 12 Aug 2015).*

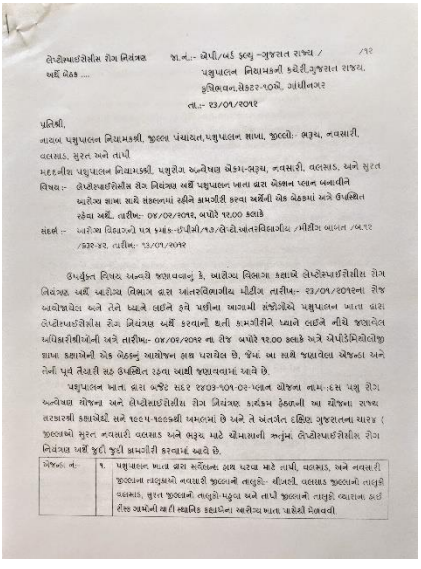

Figure 24: Letter discussing the role of veterinarians in leptospirosis control (Director Animal Husbandry, 2012)

Regarding the involvement of veterinarians in Gujarat, I had been told that the state had a two-decade-old programme on leptospirosis dating back to 1995, following the first outbreak from Valsad in south Gujarat in 1994. I found the following references to the

project, indicating a programme was in place but, sadly could not locate any other documents that might shed light on its programmatic history.

> *Under budget 2403-101-02-plan, Scheme Name: Ten Animal Disease Diagnosis Scheme and Control of Leptospirosis disease is being implemented by the State Government since 1995-96* (Director Animal Husbandry, 2012)

More interestingly, perhaps, the letter shown in Figure 24 furnished the clearest depiction of the role of animal husbandry in leptospirosis control activities in the state (Source: Office of Health Commissioner). The letter was from the Director of Animal Husbandry (2012) to the chief veterinary officers and veterinary epidemiologists[41] working in the southern districts of Bharuch, Navsari, Valsad, Surat and Tapi in Gujarat. It was dated 23rd January 2012, and possibly was sent to kick-start planning for the annual calendar of activities developed by the public health department.

The letter directed the district officers to undertake the following activities for the purpose of leptospirosis control:

- Conduct **surveillance** of livestock in high risk villages, including blood samples
- Conduct **epidemiological analysis** of surveillance data (essentially annual comparisons)
- Regularly attend **intersectoral collaborations** at district and sub-district levels for zoonotic diseases
- Develop plans for establishing an Animal Disease Diagnosis centre (a laboratory for veterinary microbiological investigations)
- Conduct public awareness campaigns for preventing the disease by distributing pamphlets at key events, such as
    - Animal Husbandry Camp
    - Animal health *mela* (fair)
    - *Krishi Mahotsav* (Agriculture festival)

Also interestingly, the letter directed that half the blood samples collected from livestock be tested at GMC, Surat.[42] This is likely because the veterinary sector still lacked laboratory capacity for leptospirosis testing as late as 2012. I was informed that the nearby veterinary universities have since started conducting serological analyses in newly opened veterinary colleges near Surat.

All my interviewees mentioned ongoing efforts to operationalise intersectoral collaborations. The letters from both the departments' headquarters instructing district officers to maintain regular contacts further support the claim. However, it is worth asking

[41] Official designation: Deputy Director of Animal Husbandry and Assistant Director, respectively.
[42] The other half of blood samples were to be tested outside the state, a lab in Chennai. Parallel testing is a commonly used external quality assurance mechanism, but maybe also signals attempts by the veterinary sector to keep tabs on the human health sector lab, or end its reliance on the medical college.

at the point, how was the partnership envisaged? Did any sector take a lead role and was the effort owned jointly by all involved departments?

The picture becomes clearer when we look at a graphical depiction of distribution of work in the annual activity plan for leptospirosis control (see Figure 25). I used the 2012 activity plan published in that year's state manual for leptospirosis control (Epidemic Branch - Commissionerate of Health Family Welfare & Medical Services, 2012) to identify and understand the allocation of activities to different sectors. While the activity plan does look well-planned and quite decentralised, as shown in the figure, it appears that there is far less collaboration among the sectors than what I was led to believe initially.

From Figure 25 it appears that apart from initial consultation, non-health sectors (i.e. agriculture and veterinary) are involved only peripherally for conducting very specific tasks one month in a year. The programme focus on human health interventions appears clearly in the figure, with little mention of non-human-health components, such as animal health protection.

While an annual calendar of activities was planned for the disease, it appears that the emphasis in the calendar, as in many bureaucratic plans, is to focus on the immediate goals (in this case, preventing a spike in disease incidence) than on developing institutionalised vision of collaborations. Planning meetings are held in the beginning of the year (Activity #2), but no provisions seemed in place for the ongoing exchange of disease information between the departments or even an end-of-year stock-taking.

Sr No	Activity	Level of activity				Sectors invovled				Time of activity											
		Village	District	Region	State	Health	Agriculture	Veterinary	Other	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Map high risk villages	■				■				■											■
2	Conduct planning Meeting	■	■	■	■	■	■	■		■											
3	Strengthen Treatment Centre	■	■	■	■	■							■								
4	Conduct regional meeting	■	■	■		■	■	■			■										
5	Procure Medicine & Diagnostics	■	■			■						■	■								
6	Anti-Rodent activity	■	■				■							■							
7	Animal sero surveillance	■	■					■						■							
8	Identify primary informer	■				■								■							
9	Sensitization Workshop	■	■	■		■						■									
10	Train Paramedics & primary informers	■				■						■									
11	Village Health committee meeting	■				■									■						
12	Generate awareness	■	■			■									■	■	■				
13	Chemoprophylaxis	■	■			■									■						
14	Active Surveillance	■				■									■	■	■	■	■	■	
15	Daily Media Briefing	■	■			■									■	■	■				
16	Case & Death Investigation	■	■	■		■									■	■	■				

Figure 25: Annual plan of activities for leptospirosis control in Surat
Developed by public health office at the state level (Epidemic Branch - Commissionerate of Health Family Welfare & Medical Services, 2012, p. 26)

The 'intersectoral collaborations' put in place for leptospirosis seem typical of many other One Health 'best practices' that involve regular interactions and joint planning by different agencies; they are convened by the human health sector and cater only to human health concerns with little discussion on the concerns of other agencies.

6.4 EMERGENT THEMES

In the preceding sections of this chapter, I have described how the programme managers in the state believed (or tried to make me believe) in the story of 'successful' control of leptospirosis in Gujarat. While highlighting the limited nature of epidemiological analyses in the public domain, I have demonstrated how the state government's claims of having 'controlled the disease' do not hold water, even with the little that we know about the disease.

This does not take away from the substantial commitment of resources, personnel and creative thinking that appears to have gone into the last 12 years of leptospirosis control in Surat and neighbouring districts in southern Gujarat. In addition to equipping peripheral health centres with the capacity and personnel to provide specialised medical care, the leptospirosis control programme has also been characterised by remarkably close collaborations between Surat-based medical faculty and the public health department. In addition, while leptospirosis continues to be seen as primarily a human health issue, and there is limited ownership by the veterinary sector, they have a specific, allocated role in the programme and regular conversations do take place between both the departments.

In the following section, I want to analyse four closely related themes that appear from the discussion so far.

The first theme is a further examination of the success story narrative built around leptospirosis in Surat. I want to examine the reasons for pushing a narrative like this—how it came together and, more importantly, how they managed to sustain a story of successful control for such a long time.

The second theme centres on the role played by politics around knowledge in building and sustaining a success story narrative. Specifically, I will examine multiple instances I came across where the access to disease information was limited. I argue this was to preserve the authority of the state and its promoted narrative.

The third theme, emanating from the previous two, focuses on the bureaucracy, including the process through which it monopolised discussion space by co-opting key actors in Surat.

The last theme is an attempt to analyse the decision-making process through the perspective of policy-makers on the ground, mostly middle-level managers.

Manufacturing a success story

> *One thing is evident: whether disciplining or empowering in intent, the operational control which bureaucracies or NGOs have over events and practices in development is always constrained and often quite limited.11 What is usually more urgent and more practical is control over the interpretation of events. (Mosse, 2004, p. 646)*

As I have described at the beginning of the chapter, my principal contacts within public health and animal husbandry departments nudged me towards studying leptospirosis control in Gujarat instead of CCHF as I had originally planned. Citing the decreased incidence of the disease and long-standing animal-human health collaborations around leptospirosis in the state, the officers assured me that leptospirosis ought to be studied as a "best practice" compared to the developing story of CCHF, a disease that was still understood incompletely.

I later discovered, of course, that there is no such thing as 'best practice' when it comes to emergency response and upon closer examination, the Gujarat experience of leptospirosis control did not seem quite as it was portrayed to be. Unlike the case of CCHF (Kakkar and Abbas, 2013), there was limited engagement of public health officers with veterinarians in either understanding the epidemiology or devising response strategies for leptospirosis. There were many unknowns about the epidemiology of leptospirosis. Changing case definitions of the disease meant that the numbers were not comparable across the years. Limited research on animal reservoirs meant that the disease transmission cycle was not understood completely, therefore making it difficult to explain whether reducing disease incidence (even if accurate) had to do with changing epidemiological cycles or an actual decrease.

When it came to developing a disease response, as discussed earlier in the chapter, apart from strengthening surveillance and ensuring access to specialised health services, the major preventive strategies either did not have proven effectiveness, such as mass chemoprophylaxis among unaffected or antibiotic treatment among suspect cases, or implemented half-heartedly, such as around establishing collaborative surveillance and control strategies among rodent and livestock species.

As discussed below, this positive spin on leptospirosis was also paradoxically countered by an increased sensitivity around sharing disease data I encountered in the field. While some senior researchers refused to discuss leptospirosis with me altogether, citing lack of written permission from the state government which, apparently, 'owned the data', many recounted their own frustrations with the state government for denying them permission to publish papers based upon their findings. This all made me wonder why officers in the public health and animal husbandry departments at the state capital felt so confident about the disease and, indeed, make an effort to showcase leptospirosis control as a 'best practice'. A part of the answer is likely to lie in the 1994 plague outbreak and its aftermath. It is estimated that the plague outbreak of 1994 resulted in losses of $600 million to the national economy and resulted in mass anxiety as reflected in the news reports of the time (Pallipparambil, 2006). The plague outbreak exposed the vulnerabilities of the public health systems, both at the state and national levels and resulted in huge investments in public health surveillance, including the launch of the first-ever national disease surveillance programme in 1997 (NICD, 2002).

The motivation to avoid a plague-like situation could be one reason why the state government was especially keen to appear being in control of leptospirosis, a disease that first became visible around the same time as the plague outbreak (Prasad, 2000), but finally erupted in public consciousness when it caused outbreaks in urban areas in Surat in 2005.

The political leadership in Gujarat has been provided by the same political party since 1998 (Wikipedia contributors, 2018). The regime at the time of the outbreak has been claimed by many to be focussed more on 'event management' (Indian Express, 2014) and political showmanship in favour of substantial administrative interventions.[43] For a government that is so protective of its image, its officers would have been under pressure to craft as favourable a story as possible.

In a context where the meaning of success is itself contested (as in the manipulation of case definition, and resultant disease incidence), what matters more than the outcomes of

[43] The extent to which political image of the government trumped public health interests in Gujarat can be best illustrated by its response to the recent Zika virus outbreak in 2016. Around one year after WHO declared Zika to be a public health emergency of international concern, and amidst popular anxiety about the possibility of outbreaks in India, the first human cases of Zika infection in India were discovered in Ahmedabad, the state capital of Gujarat. The government of the day, defying its national and international obligations on disease reporting, and also obligations to its citizens, chose to hide the fact. It is speculated that even public health officers from the state were not kept in loop as the timing of the infection clashed with a major investment summit planned in the same city, and any disruption would have been seen as a major loss of face (Biswas, 2017).

a policy process, is the nature of interpretation of the problem and the policy outcome (Roe, 1994, 1991). It is so much easier to get potential critics on board by framing a narrative of success that can conceal differences and prevent ridicule or criticism to emerge (Mosse, 2004; Sumberg et al., 2012).

Evidence-based decision-making: Politics of knowledge translation

The government crafted a story of successful disease control using several interlinked strategies. These included controlling access to disease information by restricting its access to a closed group of people, including by co-opting those voices that could potentially challenge this story. This helped the government to promote the construction of a disease narrative that it favoured and discouraged critical perspectives from emerging. This was, in turn, facilitated by the political and administrative culture unique to Surat and Gujarat, as demonstrated below.

In the absence of critical epidemiological analyses, it is difficult to make sense of the bigger disease picture in Surat. Some insightful studies did come out questioning the current understanding of leptospirosis and its interventions,[44] but these remain few in number. These include studies describing clinical manifestations (Clerke et al., 2002), descriptive epidemiology (Patel et al., 2006), and diagnostic microbiology (Panwala et al., 2015). Most research on the disease appeared to be describing the disease, without analysing the transmission pathways or risk factors that could either improve the understanding of the local behaviour of the disease or inform intervention policies.

The extent of disease transmission occurring within and between different animal species has also not been investigated adequately, thus preventing a complete understanding of disease epidemiology from developing. The only research I have come across has been done quite recently and those are sero-prevalence studies[45] among different animal species, such as those by Balamurugan (2013), Patel (2014; 2015) or Panwala (2015).

Incidentally, one of the first publications to describe the leptospirosis response in Gujarat was actually a social science critique of the limitations of the overtly clinical approach adopted by the state of Gujarat (Prasad, 2000). Sadly, there does not appear to have been further examination of the social aspects of the disease epidemiology or interventions.

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[44] For instance, see papers by Bhardwaj *et al.* (2008) and Parmar *et* al. (2013)on leptospirosis risk factors, Shah *et al.* (2012) reporting isolates and several papers questioning chemoprophylaxis (Bhardwaj et al., 2010; Charan et al., 2013, 2012).

[45] These studies typically identify prior exposure of animal immune system to leptospirosis without identifying the type of exposure.

From the few studies medical faculty have been allowed to publish, it seems that there is a need to question government narratives around leptospirosis. But as was made clear to me multiple times in Surat, the data from leptospirosis surveillance was 'owned' by the government and therefore, analyses could only be published after taking their consent. As a result, the faculty have several graduate dissertations and other research manuscripts that have still not been published for lack of consent from the state government.

I had an opportunity to experience the heightened sensitivity with which leptospirosis data were treated when I went to interview the faculty in GMC, Surat. In my personal interactions with different stakeholders in Gujarat, I was surprised at how informal and personal the interactions were on one hand and the evasiveness that existed with regards to sharing data on the other. Despite being known to state programme managers and following repeated requests for a formal letter of introduction from them, I was assured that it was not needed to schedule interviews around leptospirosis in Surat. However, when I went, a different picture presented itself.

Like most policy researchers, I have had my requests for interview or information politely fobbed off before. However, it was the first time in my PhD fieldwork, that I was turned back without any information, interview or explanation. As I recorded in my field diary below, I encountered an inexplicable, but very real resistance in discussing leptospirosis in the office of the Community Medicine department pictured below (Figure 26).

Figure 26: Community Medicine department in GMC, Surat.

> *The professor invited me to morning tea in the college canteen with the whole team of faculty and residents from the community medicine department, apparently a daily ritual. While the informality of the team*

> *during tea impressed me, I was struck by how uneasy the professor seemed sitting across from me. He asked me some disjointed questions about PHFI, my residence and field sites, but did not respond to my reference to my research questions.*
>
> *After tea, we went to his office, accompanied with two other faculty members. When I started to move beyond small talk and introduced my research questions, he immediately responded with "But what is exactly the purpose of your study", and "How will you cite the source of this information".*
>
> *I thought I had already explained this in our previous meeting, but did it again anyway and passed the information sheet and consent form to him. I was sent out and asked to wait for ten minutes while the GMC faculty tried to make sense of my documents and possibly deliberated upon a strategy to handle me.*
>
> *I was told that the other two faculty members would be answering my questions. He did not give any reasons for this.*
>
> *Things got even stranger. I followed the two academics, an Associate Professor and a young Assistant Professor, to another (smaller) faculty room deep inside the corridors. When we got settled again, I circulated the forms to both of them again. This time I took care to highlight the key clauses from my consent form, "You will not be identified as an informant, if you don't want to. I will ask you specifically before ascribing a quote to you. The recorder is only to assist me in note-taking, but it's OK not to use it, if you don't like".*
>
> *It took the senior academic fifteen more minutes to go through the form, before apologising and saying to me, "I didn't realise, but I will have to speak to the Dean about this before talking to you".*
>
> *I also mentioned that all the senior public health officers knew about my study and was happy to have them confirm this on the phone, if he liked.*
>
> *However, that didn't work and off we went to the Dean's office, where the Assistant Professor and I waited outside for another half an hour. He later came out, and finally informed me, "I have spoken to the Dean/Principal and he says that you can't interview or collect data without a formal letter from the Regional Director". (Field notes, 9 Feb 2016)*

The above interaction at the GMC was when I realised about the fragile nature of the disease control narrative and the uncertainty accompanying it. Even as everyone claimed the disease to be under control, many remained apprehensive about it, to the extent that even a discussion among health professionals was seen as potentially challenging the disease control narrative. As told to me by a senior public health researcher,

> *But most unfortunate part will be, it will be very difficult for you also to understand that, in spite of leptospirosis being there in south Gujarat for so long, there are no great publications out of it. For some reason, the government was very sceptical about using the data. They have never allowed data to be utilised.*
>
> *So there are very few publications, I am not aware about very recently if anyone has published but I remember 4 or 5 publications, not beyond that by Rajesh Chudasama and Pankaj, one or two, there are numerous dissertations*

> *which have been done on leptospirosis lying vacant, lying unutilised in medical college of Surat. Huge amount of work has been done (E3- 21 Aug 15).*

The defensive stance of many of the stakeholders involved was further emphasised by complete refusal to share information around the disease data with me, even as the public health officers themselves were much more forthcoming.

The sensitivity about sharing surveillance data is not peculiar to Gujarat alone. There are heightened public anxieties accompanying communicable disease outbreaks where state intervention usually follows reported deaths, or serious illnesses. This has led many countries to enact laws that provide overarching authority to the governments to suppress individual liberties and use police powers to maintain law and order, including India (Kakkar et al., 2010) as also elsewhere (Gostin, 2005).

However, as demonstrated in the case of leptospirosis, if the disease data are not opened up for analysis, it will prevent an informed public debate, and will almost surely result in weakened public health performance. The need to protect patient confidentiality is obviously paramount in such situations, and it is difficult to find a justification for not sharing anonymised disease data for the public good (Fairchild and Bayer, 2016; Mello and Gostin, 2009).

In line with the discussions in this chapter, it can be argued that restricting access and analysis of public surveillance data through preferred agencies even a decade afterwards is an attempt to influence discourse and extend the authority of state. The way information regarding the counting of the dead and diseased in a population is politicised brings to mind Foucauldian notion of biopolitics as well as the technologies of rule exercised by the state (Corbridge et al., 2005; Rose, 2001). One of the ways in which the government seeks to shore up the credibility and legitimacy of its decisions is through the instrumentalised use of scientific advice and constructing a hegemonic narrative that seeks to paper over the conflicts (Jasanoff, 1992; Mosse, 2004). The problem with such emergent narratives is that by nature they are fragile and require constant vigilance to prevent alternative framings to emerge. Just how can a consensus emerge among a disparate group of actors, is discussed in the next section.

A coalition of the unwilling

Another factor that appears to have facilitated the promotion of a success story narrative around leptospirosis has been the co-opting of most of the public health and medical community in the decision-making process by the district health administration. This is likely to have occurred spontaneously, possibly after the 1997 leptospirosis outbreak

following close on the heels of the 1994 plague outbreak. A pre-existing history of medical college's participation in public health programmes is likely to have facilitated the partnership, as posited by other reviews on collaboration (Bryson et al., 2006; Thomson and Perry, 2006). In addition, at the time of the initial outbreak, a senior public health professor from GMC, Dr Vikas Desai, had been deputed to the Health department in the state capital as a programme manager. Consequently, she was well placed to have mobilised the GMC faculty for acting as a champion for and in assisting the government's leptospirosis response efforts, and possibly another reason why the academia-practice collaboration developed and sustained over the years.

The academics mostly agree that they themselves benefitted from the association. When leptospirosis was first identified in Surat, apart from an academic understanding, there was very little personal experience of identifying or managing the disease among the clinicians and public health practitioners alike. As recounted by a former clinician from GMC:

> *That was the first time that we had seen the disease and before that certain sporadic cases were occurring, but probably they were going unnoticed and undiagnosed…. That was the first time I saw cases of leptospirosis and read in textbooks as under graduates (D13, 9 Feb 2016).*

In a situation where even the local experts were taken aback with the novelty of the disease, as well as severity of the presentations, it would have been extremely difficult for the government to mount an effective response. This made the crisis-like situation at the time perfectly ripe for innovative ideas, such as an academic-policy collaboration (Atun et al., 2010; Tennyson, 2004).

> *The curious aspect is that as we also felt that why only Gujarat has got pulmonary symptoms. Karnataka…has got hundreds of cases of lepto, but very few of pulmonary haemorrhage and Tamil Nadu… We had gone once to Tamil Nadu for our conference for lepto and there they said that we don't see many (pulmonary cases), as the patients come and given dialysis they go away and so you can't compare the mortalities at all.*
>
> *We used to be always (asked) by our officers, "Why your mortality is very high as Tamil Nadu has low mortality?" But they (Tamil Nadu) don't have pulmonary involvement at all. They have typical Weil's syndrome. In kidney involvement you do dialysis. But here the pulmonary haemorrhage is so severe that nothing works (D13, 9 Feb 2016).*

Once you have the right of state, as well as a consistent and scientifically compelling framing that fits into the dominant narrative, it became difficult to be challenged (Mosse, 2004). All local actors were co-opted into the story. Having the local medical college's cooperation in outbreak investigation and response helped legitimise the government's strategy.

The government, for its part, convened high-level meetings regularly in the initial years, paying close attention and providing resources for treating affected individuals. As an example, one of the doctors mentioned how ventilators were procured for even smaller government hospitals and, in the initial years, when there was limited capacity to be able to provide intensive care, medical personnel from GMC used to be deputed in monsoon months to run these centres and provide secondary care closer to affected areas.

The technical competence of the work at the time could be judged by the fact that the NCDC, which was supposed to be the premier national centre for advising on disease outbreaks such as this, actually found the operational manual developed by GMC in 2005-06 good enough to serve as inspiration for its own manual (see Figure 20).

On the other hand, apparently microbes are not similarly impressed with the endorsement of technical institutions. And the actual burden and transmission of Leptospira still retains a lot of uncertainty. As discussed earlier, regularly changing case definitions, limited research among other reservoir and carrier species, and reliance upon interventions of dubious effectiveness and safety means that there is still a lot we do not know about Leptospira in Gujarat and it cannot be claimed with any certainty that the disease numbers will not increase back again.

Regardless of the current state of Leptospira, at the time of the initial outbreaks, and in an environment of rising anxiety about the disease, the government at the time did well to bring together professionals from different disciplines to lend their expertise to its efforts to control the disease. By forging such a network of professionals, the government was not only able to increase the scientific validity of its response, but, as is the norm with other state actors, it was also able to inspire confidence about the credibility and effectiveness of its efforts to control the disease (Jasanoff, 2006). Importantly, after the initial outbreak season, by having the leading professionals of the district by its side, the government was able to capitalise upon this association to lend credence to the ensuing narrative about successful control of the diseases.

Governing public health: Exercising leadership in uncertain times

The capital of Gujarat, including the headquarters of all departments and the state legislature, is located in the city of Gandhinagar. Having replaced the much-older capital of Ahmedabad, this city was built with the explicit purpose of housing the chief organs of the state and, by extension, projecting the authority of the state. It has wide boulevards allowing for smooth flow of vehicular traffic and is lined by big open spaces or huge ministerial office complexes on either sides (for instance, see Figure 27).

Figure 27: New secretariat complex in Gandhinagar.

One of the peculiarities of the city housing the state's political and bureaucratic leadership is that most traffic lights do not seem to be working at any time. Instead, most of them are flashing red even during peak hours. The rationale for this oddity, as explained to me by the locals, is that people do not like to wait for traffic signals unnecessarily when they are working and prefer making their own way instead. Apparently, the people running all the main organs of the Gujarat have more trust in their individual abilities to negotiate their right of way with fellow commuters in an efficient manner than they have in the state's ability to keep traffic moving. I cannot help but wonder whether this is a metaphor for my observations around leptospirosis, where short-term political expediency of projecting success sometimes took precedence over long-term, more substantive public health concerns.

This ability of state officers from Gujarat to project a narrative of success came from their ability to make use of an institutional set-up unique to the state. First, the structure of the department of health itself. Following the structure of the central ministry, state ministries of health are headed by a political leader, i.e., a minister who is advised by a bureaucrat, the Principal Secretary. The Secretary leads the secretariat staff, responsible for budgeting, procurement and managing the administrative work of the departments. In the department involving specialised expertise, such as Health or Animal Husbandry, there is an independent cadre of technocrats. In the case of health ministry, they are headed by a

Director/Commissioner of Health Services who provides technical advice to the minister and secretary.

While the post of director/commissioner in most states is generally held by a health professional, in Gujarat, the Commissioner of Health Services post has been earmarked for a generalist bureaucrat belonging to the Indian Administrative Service (IAS) cadre—just like the health secretary, but more junior in the hierarchy. According to public health personnel, this not so subtle appropriation of a technical role by the generalist IAS and the clear demarcation of hierarchy vis-à-vis the health secretary has led to the undermining of the public health workforce in the state health department.

The argument goes that, unlike the generalist IAS officers, who are often rotated among different ministries with three-year terms, technical officers serving in the public health directorate seldom enjoy a similar level of mobility or visibility, and are therefore mandated to provide a longer term vision to the health department that is informed by their technical training and expertise. The takeover of the role of health commissioner by IAS officers in Gujarat would, therefore, imply that the value of technical advice becomes subservient to short-term politically opportunistic concerns while deciding public health strategy.

This explanation does not mean to imply that public health officers cannot make a contribution in Gujarat or that all policies are short-term and politically opportunistic. Rather, the above explanation seeks to point out the tensions and conflicting interests of technocrats and bureaucrats. It also seeks to demonstrate how heavily the cards are stacked against incremental public health strategies in favour of more visible and maybe less effective strategies such as drug administration or supplying ventilators in peripheral hospitals.

When discussing past managers, most bureaucrats say good leadership is defined by their ability to ‘extract work from the system’. This is a phrase I have heard multiple times during my interactions with government officers all over India. This way of thinking about work, which involves a leader getting a recalcitrant bureaucratic workforce to deliver, contrasts with the self-motivating ethos of medical and teaching professions.

When academics start working closely with bureaucrats, is it likely for a clash of working styles and motivations to emerge? One manifestation of the clash in working styles was possibly expressed in the refusal of the public health department of the medical college to discuss leptospirosis with me. While I was waiting with the young public health lecturer outside the Dean’s office in Surat, he cited the restrictions placed upon government

servants in interacting with the media and others from outside the system possibly to justify the wary attitudes of his superiors. However, the notion of epidemiologists not discussing analysis of historic surveillance data seemed anachronistic to me, especially since the bureaucrats seemed much more open to talking to researchers like me than did some of the academics themselves.

Jasanoff (1987) cites the blurring of boundaries between scientists giving advice and the decision-makers acting upon it, with the difference often constituted through the very act of advice giving. Is it possible that the academics also started identifying more with the policy-makers during the course of their interaction? And might this explain why interventions with questionable efficacy and safety like mass antibiotic administration were endorsed by the academicians?

Maybe this is the reason why, for all their confidence in leptospirosis strategy, the ownership of surveillance data still remains restricted to official use only. Despite the surveillance database being initially maintained by the public health faculty in the local medical college, there are limited number of studies that have examined the epidemiology of leptospirosis in the region, or interrogated the effectiveness of the intervention strategies being deployed in the state.

And perhaps, this is also the reason why the veterinary component did not seem to be fully integrated with programme functioning in Surat. A simplistic success story narrative could only develop within the group with established hierarchies and dynamics. This narrative was uncomplicated with considerations of non-human carriers or reservoirs and, more importantly, was able to explain why the disease numbers seem to be coming down.

Giving additional importance to veterinarians and to animal reservoirs would mean developing a more complicated framing for the disease situation and opening up to the fact that leptospirosis could not be controlled as easily by the health department, and which promised less chances of success.

The traditional view of bureaucracy as Weberian apolitical implementers is now frequently problematized (Keeley and Scoones, 1999). There is much more awareness about the messy, non-linear, incremental ways in which bureaucrats interact with different actors and exercise varying amount of influence in the policy making processes (Gupta, 2013; Oliver, 2006; Zahariadis, 2007). Bureaucrats' engagements with science often serve to depoliticise the decision-making by portraying it as a rational method (Fischer and Forester, 1993). This is especially true for zoonoses, which some have said suffer from "technocratic tyranny" (Waltner-Toews, 2017), and is also true for

leptospirosis where the political implications of defining cases, debating interventions, or selecting areas for chemoprophylaxis never came to light in public.

Politics of the middle

While the previous arguments explain the different decisions behind leptospirosis control in Surat, I believe they do not offer a full story. It was only at the end of my fieldwork when I stopped interviewing and started having more relaxed conversations with my key informants that I started to get a more personal feel for the everyday realities of decision-making.

I believe it is important to take a more sophisticated look at the machinery of the state and not view the policy elites as a monolithic community. If we distinguish field level implementers from the big-picture policy formulators, there is still a gap in the middle—people whose job it is to bring everything together. These are the individuals, like the public health officer in Surat (D10, quoted earlier in the chapter), who while realising the limitations of chemoprophylaxis, have to develop it in a way that appeals to all stakeholders involved, from the political leadership, his superior officers, other engaged actors as well as the implementing workforce and the affected communities themselves.

Figure 28: Roe's Control Rooms: A veterinary epidemiologist's office in Surat.

And the biggest descriptor of their job function—technical programme managers such as these must operate under conditions of high uncertainty, with limited information at their disposal. This brings to mind the description of policy messes by Roe, which are characterised by:

> *high degrees of uncertainty, and coping, muddling through, groping along, sub-optimization, bounded rationality, garbage can processes, second-best solutions, policy churn and policy fiascos, rotten compromises, managing the unexpected, crisis management, and that deep wellspring of miserablism, implementation and policy failure.* (Roe, 2016a, p. 372)

Drawing on scholars of policy analysis (Sabatier et al., 2007) and uncertainty (Stirling, 2010), Roe translates his observations on control room operators (Roe and Schulman, 2012) to managing policy messes. He makes the point that to function with reliability, i.e., maintain service provision even in turbulent conditions, 'high reliability professionals' work on managing the messes and not cleaning them up altogether. There will be room for learning on the job and constant translation of 'macro-design' policy frameworks by these mid-level professionals to meet anticipated needs locally.

There are certain obvious parallels of Roe's framework of high reliability management with leptospirosis response in Surat (Figure 28). There was limited information, accompanying uncertainty about the nature and distribution of the disease or the efficacy of the small number of interventions presented to the decision-makers. There appeared to be little understanding of how to prevent the disease, reasons for its serious presentation in Surat (i.e. more cases of pulmonary involvement), and limited evidence regarding the effectiveness of antibiotics, the mainstay of the treatment strategy. However, they had to make do with what information was available—a case of bounded rationality as it were—and develop an intervention strategy that worked but, also importantly, was seen to be doing work. There were investments in increasing surveillance, but also provision of specialist treatment services in peripheral hospitals, a concept unheard of until then.

> *One of the major challenge was that you will get hardly one case per village with this type of involvement. And most of the villages reported case once in all years or twice in all years. Very few – two or three villages, I remember, had consistently reported cases. And (by cases, I mean) multi-organ involvement or critical cases. (D16, 9 Feb 2016)*

As mentioned above, the leptospirosis cases presented sporadically, the public health department decided to provide antibiotics to prevent the emergence of more cases, initially to all the residents of the village but subsequently restricted to everyone at a higher risk of contracting the disease.

Stretching the analogy a little more, what does this mean for intersectoral collaborations? Can we also view them through the lens of 'muddling through' and as a way to cope with uncertainties of infectious diseases (Lindblom, 1979, 1959)? Researchers in other disciplines seem to think on these lines. Quick & Feldman (2014, p. 673) make the case for working on boundaries for "*creating junctures: translating across, aligning among, and*

decentering differences" across different spheres of public management and promoting resilience overall in the system.

The adaptive governance framing proposes policy actors at multiple levels and cutting across sectors working autonomously to interact with each other that will create synergies, increase capacities to respond to and bounce back from newer shocks (Dietz et al., 2003; Schultz et al., 2015). Looked at from this perspective, the innovations emerging from leptospirosis response in Surat can be seen as an organically emerging response to crisis events shepherded by semi-autonomous public health officers seeking most gain within resources (and networks) available to them.

This framing does not answer all the questions around how the leptospirosis control strategy has developed over the years since the initial crisis, or about the intersectoral collaborations between different sectors, however, it does point towards the importance of the everyday practices of middle-level bureaucrats responding to uncertainties through improvisation and innovation within constrained circumstances, framed by overarching discourses and politics..

6.5 CONCLUSION

To summarise, leptospirosis control strategies in Gujarat have a history of around two decades. The leptospirosis narrative has changed with time – starting with its status as a relatively unknown, but, potentially dangerous disease, to the current popular perception of a disease that is now supposed to be in decline as a result of apparently successful control policies put in place by a responsive government with the help of committed experts.

Like most policy narratives (Roe, 1994), however, the above description of leptospirosis control in Gujarat is also a reductionist, partial and slightly misleading account. In my analysis of leptospirosis policy debates in Gujarat, I found alternative, and more interesting, aspects that also deserve highlighting. I found the evolving nature of leptospirosis control strategies in Gujarat from the 1990s to the present day to be a fascinating illustration of the non-linear, incremental and messy nature of decision-making that often takes place in climates of high uncertainty and bounded rationality (Keeley and Scoones, 1999; Zahariadis, 2007).

One fallout of the crisis situation characterising early leptospirosis outbreaks is that it provided the public health agencies opportunities to experiment with new ways of doing things (Atun et al., 2010; Kingdon, 2010). Realising the limitations of going it alone early

on, the public health department found willing allies in the local medical faculty who were as concerned about the disease as them and provided their expertise for characterising and responding to the outbreaks.

The crisis situation also prompted collaboration with the animal health agencies given the zoonotic nature of the disease. In successive outbreak seasons, as the disease appeared to be in decline, the importance given to the role of animals in disease transmission declined and the role of veterinarians became much more circumscribed. After those initial meetings, the collaboration is still kept alive through regular meetings, however, and can be reactivated when required, as seen in the case of CCHF.

The case of leptospirosis also demonstrates the amount of time and effort invested in the crafting and maintenance of a success story narrative (Mosse, 2004). As narratives of success stories go (Sumberg et al., 2012), it is in the political interests of the dominant actors (in this case, the public health department) to continue with the simplistic narrative of 'leptospirosis being under control' without making it unduly complicated with the nuances of changing case definitions and role of animal reservoirs, .

Just as in the case of anthrax discussed in the previous chapter, and also with brucellosis, as we will see in the subsequent chapter, the engagement of experts with policy making is quite political in nature, precisely because, the association of scientists with policy making often ends up depoliticising and legitimising the policies (Fischer, 2009; Jasanoff, 2003), as demonstrated in the discussions leading to the adoption and internalisation of chemoprophylaxis as a key intervention strategy.

Some of the policy decisions came about quite early on, others were developed with or refined over the course of a number of years. If the performance of leaders is to be measured in terms of limiting the number of shocks and limiting the intensity of crisis events on the system, the public health leadership in Gujarat must be credited with ensuring the apple cart of public affairs did not upset.

Despite the limitations of its strategy and execution, is this a model for public health response that we can study for developing future response strategies? More relevant for this thesis, can the Gujarati approach to intersectoral collaborations, based on everyday, pragmatic interactions, be taken as a template for establishing limited, but practical and sustainable intersectoral collaborations for One Health? I will return to these questions in chapter 8, after exploring the case of brucellosis across two states.

7 BRUCELLOSIS

7.1 INTRODUCTION

Brucellosis is, in many ways, the odd one out of the three disease-based case studies I discuss in this thesis. Unlike anthrax and leptospirosis, it does not result in localised outbreaks. Instead, brucellosis causes low intensity infections that can persist for years among affected animals as well as humans. In addition, unlike the localised presence of other two diseases, brucellosis is fairly well spread all over India.

A third point of difference relates to the disease characteristics and the resulting attention to the disease. In the case of leptospirosis, it was the high number of deaths among humans that resulted in leptospirosis assuming a highly visible place on the policy radar. Whereas in the case of anthrax, it was the sudden and visible nature of deaths among livestock (and risks to humans) that helped mobilise a quick response from officers. In contrast, brucellosis has a much more subtle presentation, where deaths are rarely ascribed to the disease in animals and humans.

As I will demonstrate later in the chapter, instead of health impacts of brucellosis, it was the economic impact on the dairy sector that compelled the government to develop a comprehensive control strategy for the disease. A final point of difference is that unlike the reactive collaborations found in the case of other two outbreak-prone diseases, it appears brucellosis has not been able to elicit collaborations between animal and human health agencies, despite its entrenched nature.

While the above description explains the unique nature of brucellosis, in many other ways, brucellosis inspires discussion on similar themes as my other two disease case studies. Like other zoonotic diseases, there are huge information asymmetries in the case of brucellosis as well. As in the case of other zoonoses, this reduces the decision-making space for brucellosis, but in different ways. Whereas the chapter on leptospirosis showed how state agencies could seek to influence the public discussions by restricting access to disease data, discussions around both anthrax and leptospirosis demonstrate how experts use asymmetries of information to interpret evidence in a way that advances their political interests. Building upon the same theme, the case of brucellosis demonstrates how a disease can be hiding in plain sight, even when its presence has been established many times over. The disease also helps make the point that having an high disease burden does not lead to prioritisation on its own; instead, the political interests of key stakeholders might be dictating eventual policy preferences.

In this chapter, I identify possible explanations for the apparent mismatch between disease burden of brucellosis and the policy attention it gets and analyse its impact on policy response from animal and human health sectors. For one, the veterinarians themselves appear to have mixed feelings about publicly acknowledging the magnitude of the disease. An explicit recognition of the disease status could potentially lead to reduced consumer confidence in the largest dairy cooperatives in the country and affect livelihoods. This is also likely to lead to further questions around the availability, feasibility and acceptability of different intervention measures for controlling the disease—which is another difficult conversation that many would prefer not to have.

Cattle are economically important livestock species that contribute in a big way to the dairy sector; also, they are most affected by brucellosis in India, making brucellosis control among cows the principal component of any brucellosis control strategy. However, unlike other countries that have controlled brucellosis through a mix of vaccination and culling strategies (Smits, 2013) the sacred status of cows in north Indian political discourse and poor animal tracking systems make the strategy difficult to replicate in India.

An added challenge associated with brucellosis is the stigma associated with the disease among veterinarians, which, in turn, explains the resistance to handling live vaccines of brucellosis. Talking to veterinarians and observing the high-risk environment they work in informed my reflections around the different ways in which risk is conceptualised by veterinarians as well as other actors.

Lastly, I discuss the near-absence of intersectoral collaborations in the light of these distinct, but interrelated, aspects of brucellosis. This offers a useful vantage point to examine the conditions needed for developing intersectoral collaborations, which apparently are absent in the case of brucellosis. This discussion also sets a context for identifying alternative forms of intersectoral collaborations and discussing their viability, as proposed in Tamil Nadu, and discussed in the next chapter.

7.2 DISEASE CHARACTERISTICS

Brucellosis causes long-term infection across multiple livestock, wildlife species, all of which can transmit the infection to humans. It is possibly the oldest animal-origin disease identified, its transmission having been recorded in a 2.4 million year old hominid found in South Africa by British army physicians in the mid-nineteenth century in Malta[46] (H. V Wyatt, 2013). Its presence and distribution in India has been well established—the initial

[46] Which is the reason why brucellosis is sometimes also referred to as 'Malta fever'.

work on the disease being done by the veterinarian Polding in the 1940s (1948) by which time the animal-human link was widely known.

As described in Table 8 below, there are three major strains of *Brucella spp.*, the bacterium responsible for the disease, affecting human and livestock populations. Each strain prefers different host species. While *Brucella abortus* affects dairy livestock, and consequently has the largest economic impacts, the small-animal-affecting *B. melitensis* is the species most commonly associated with human brucellosis and causes particularly severe illness. It is worth noting that both *B. melitensis* and *B. suis* have been developed into biological weapons, a fact the WHO (WHO)'s official guidelines state the "health and veterinary authorities should be aware of" (Corbel, 2006, p. 18).

Table 8: Principal zoonotic strains of Brucella

Brucella species	Main species affected	In humans
B. abortus	Cattle (Cows), Buffalo	Mild infections
B. suis	Swine	Uncommon, Severe
B. melitensis	Sheep, Goat	Most common, Severe

However, unlike anthrax, whose potential for weaponisation is much discussed, *Brucella* species do not seem to attract a similar attention. Public discussions about brucellosis, like the disease itself, is low intensity and difficult to spot. Brucellosis is a chronic[47] infection in animals among whom the key sign of frequent infection is decreased productivity. It causes repeated abortions in mature females, after a succession of which they generally become reproductive again, but with decreased productivity. It causes inflammation in and around the testes of male animals. Humans get infected through close contact with animals, such as during delivery, or through consuming products such as unpasteurised milk. Some cases of inhalational brucellosis have also been reported in high-risk environment such as abattoirs and wool sorters (Corbel, 2006; Kumar and Singh, 2013).

The non-specific presentation of brucellosis in animals is also present in human patients. The most common feature of infection in humans is intermittent fever accompanied with weakness persisting over a long duration, sometimes accompanied with body ache. Given low awareness about the disease, it rarely gets a quick diagnosis or appropriate treatment. Some estimate that public health systems might miss diagnoses of up to 85% of brucellosis patients in the absence of high degree of suspicion and availability of serological diagnostic tools (Mantur and Amarnath, 2008, pp. 544–5).

[47] Chronic refers to illnesses that persist for a long time (several months to years).

India has among the world's highest numbers as well as among the most dense cattle populations in the world (Thornton et al., 2002). More worryingly, perhaps, India also hosts the highest number of livestock owners living in absolute poverty, which can be used as a proxy for livestock farming in suboptimal conditions (Grace et al., 2012b).

The close interactions between large number of livestock and humans in potentially high-risk settings are likely to amplify the transmission of zoonotic diseases. Since we know there is a high level of brucellosis circulating among the livestock populations in India, there is no reason to suppose that similarly high levels of brucellosis might not be present among humans as well.

However, such is the lack of data on human brucellosis in India that two systematic reviews conducted in the last 10 years did not find even a single study from India meeting their criteria for good epidemiology for estimating incidence (Dean et al., 2012; Pappas et al., 2006). As a result, these global estimates completely discount the burden of human brucellosis in India. This is in many ways painting an inaccurate picture of global brucellosis.

Veterinary researchers have conducted dozens of serological surveys for brucellosis over the past few decades in India.[48] However, in the absence of epidemiologic design, they cannot provide a big-picture understanding of disease burden and can only offer fragmented picture of the disease across different states, species and animal holdings. Reviews of literature conducted by the National Dairy Development Board (NDDB) reported a prevalence of 22.2% at the national level, with relatively higher values in poorer states in the northern and eastern regions in India (NDDB, 2015, p. 11, 2007, p. 1).

While different studies cannot really be compared because of different populations, sampling methods, etc., as depicted in Table 9, a review of all brucellosis sero-surveys showed remarkably high levels of prevalence of the disease among all major livestock species (NDDB, 2015, p. 10). Given the importance of cattle and buffalo productivity in the dairy sector, such high levels of brucellosis are likely to result in huge economic losses, estimated by some veterinarians to be around US$ 3.4 billion annually in India (Singh et al., 2015, p. 211).

[48] For example, (Agasthya et al., 2007; Appannanavar et al., 2012; Dhand et al., 2005; Handa et al., 1998; Hundal et al., 2016; Isloor et al., 1998; Kumar et al., 1997; Oshi and Myers, 1969; M. D. Patel et al., 2014; Pathak et al., 2014; Renukaradhya et al., 2002; Singh and Parikh, 2014; Yohannes and Gill, 2011).

Table 9: Prevalence of brucellosis in livestock (Source: NDDB, (2015, p. 10)

Animal species	Reported incidence range in different studies (%)
Cattle	0.4 – 56
Buffalo	0.3 – 30
Sheep	2 – 50
Goat	1 – 39
Pig	1 – 17
Camel	1 – 7
Mithun[49]	15 – 34
Equines	38 – 42

A follow-up paper by the same group of researchers estimates around 0.17% of Indians get affected by brucellosis every year (Singh et al., 2018, p. 148). If this were an accurate estimate, it would translate into an annual incidence of 2 million cases among humans which would far surpass the current estimates for global incidence of human brucellosis of 500,000 reported by Pappas *et al* (2006, p. 91). Regardless of the exact numbers, even from the limited nature of analyses conducted in India, it is clear that brucellosis has been established for a long time and is spread across India. Brucellosis is likely to result in substantial disease burden and economic losses, even if we do not know the exact figures.

Given the entrenched nature of brucellosis in India, its presence across multiple domesticated and wild species as well as humans, geographic spread, non-specific clinical presentations as well as risks to consumers, controlling the disease would require a multi-pronged strategy that prevents and controls the disease in community, farm, clinical as well as consumer settings. Smits (2013) advocates for a vaccine-led approach for controlling brucellosis in high risk areas, supported by other interventions:

> *Effective vaccines for the control of brucellosis in cattle and small ruminants are available and cheap, and in high-risk areas there is an urgent need to start large-scale vaccination programmes... Essential to the success of mass vaccination in controlling brucellosis is achieving a high degree of protection of adult livestock in a very short period and vaccinating young stock before natural infection can occur. To reduce the risk of transmission of infection from neighbouring areas where animals are not vaccinated, a region-wide approach is important.*
>
> *An up-to-date livestock census and an effective surveillance system are crucial for the control of brucellosis, as the disease may quickly re-emerge from remaining foci of infection. Although test and slaughter may be an option for the management of remaining or re-emerging foci of infection, such a strategy is frequently not an option because of the cost (Smits, 2013, p. 219).*

[49] Mithun is a bovid, indigenous to North-eastern India (Shisode et al., 2009)

Singh and Kumar (2013) further add to the reasoning by Smits to favour a vaccination-led approach in the context of India, citing a range of factors. The limited reach of veterinary services, coupled with a rapidly expanding dairy sector, means that diagnostic as well as response capacities are limited, animal identification systems almost non-existent and compensation for culling is frequently not possible. While brucellosis is known to be a 'herd disease', culling large number of animals is not possible because of logistics, acceptability as well as economic reasons.

This leaves vaccination accompanied with repeat testing and farm hygiene as the only viable intervention strategy. However, there are many challenges even with executing such a reduced strategy, as mentioned below and elaborated upon later in the chapter. First, while vaccines exist against all major strains of *Brucella spp.* that occur in different livestock species, current disease control efforts exclusively use S-19 vaccine which is effective against brucellosis in cattle and buffalo. This means that the more serious forms of brucellosis occurring in sheep, goat and pigs get ignored. Another challenge of organising large scale vaccination drives for brucellosis might lie in the attitude of the veterinarians themselves. The S-19 vaccine is a well-established one but carries with it slight risks of accidental infection to the veterinarians administering the vaccine, which has resulted in veterinarians being hesitant about adopting the vaccine. This is explained in more detail in the next section.

7.3 PRACTICES

7.3.1 Risks & Apprehensions

A fact about brucellosis that I became convinced about gradually in the course of my fieldwork was that the veterinary community was not only aware of the disease, but quite concerned about the impact on their profession as well. Almost all the veterinarians I met personally knew of someone who had contracted brucellosis and commented on the "high levels" of the disease.

Veterinarians' perceptions of being at much higher risk of catching the disease is borne out by their personal experiences, as well as multiple sero-prevalence studies, as shown in Table 10. A review of different studies examining brucellosis in high-risk humans showed a positive immune response among 12-40% in veterinarians and 6-51% in para-veterinarians. Similarly high levels of exposure were also reported among other occupational groups working with animals as well (NDDB, 2015, p. 17).

Table 10: Prevalence of brucellosis among occupational groups
Source: NDDB, (2015, p. 17)

Exposed group	Prevalence (%)
Vets	12-40
Paravets	6-51
Abattoir workers	1-69
Patients with FUO[50]	1-12
Patients with other symptoms	7-92
Other occupational exposure	1-45
General population	0.5-4

The increased awareness of the risks from brucellosis and its enzootic spread could be why veterinarians have ranked brucellosis as a priority disease, as recorded by multiple authors and institutions in the last 10 years. This includes identification of brucellosis as a "zoonotic disease of public health importance" by the NCDC (Venkatesh et al., 2016) and specifically labelling it as a priority zoonosis for India by zoonoses researchers at the Public Health Foundation of India (PHFI) (Sekar et al., 2011). Similarly, a WHO report on 'control of neglected zoonotic diseases' identified brucellosis as a focus disease because of its endemicity and association with poverty (2006, pp. 4–5).

But coming back to the veterinarians and their apprehensions about the disease, it is likely to have been fuelled by the symptomatology of the disease. It is understood that among humans,

> *The main symptom is recurrent bouts of high temperature, hence its other name 'undulant fever'.... A chronic debilitating disease, it can cause a variety of other symptoms, including joint pain, fatigue and depression (WHO, 2006, p. 12).*

While brucellosis mostly presents as a painful, incapacitating illness, it has also been known to cause infection of the male reproductive system in a small number of cases, and might possibly be sexually transmitted among humans as well (Corbel, 2006; Vigeant et al., 1995). Though recent studies show this is less trues now, the veterinary workforce in India was traditionally dominated by men (Veena and Rajeshwari, 2008; Vijayakumari and Prathaban, 2003). It can be argued that the masculine professional culture of the field veterinarians, combined with small chances of sexual transmission and debilitating nature of the disease, could explain the stigma that so marks a diagnosis of brucellosis.

The following excerpt from an interview that I conducted with a veterinarian brings home what it might feel like to experience the illness, concerns accompanying the disease and the impacts it might have on the professional and personal lives of a veterinarian. I came

[50] FUO is Fever of Unknown Origin, categorised when the diagnosing physician is not able to identify the cause of fever in a patient and has ruled out most likely explanations (Brown, 2015).

across a young veterinary officer (whom I refer to as B2) who got brucellosis. Troubled by multiple relapses, he had decided to quit his job to begin his recovery from the disease. Here he narrates his experience of how he found about his disease and was trying to get it cured:

> *It started in August 2014 – I got mild fever. I took one paracetamol. Then after one week, again one hour fever. Then again next month.... As I got fever for three days continuously, I went to a doctor. He gave me amoxicillin for five days and paracetamol. The fever subsided. Then I was happy for another two months when it started again. It will come for two or three days (and then) it will just go away. Rest of the time I was normal.*
>
> *In December, I went to three doctors. When I went, they took... malaria, dengue, all blood counts. The blood was normal. They gave me five days' antibiotic again. Any antibiotic, any bacteria will respond to something, right? In January, in March, it happened again – I got fever. Finally, in May, I diagnosed (myself, that) I had brucellosis.*
>
> *I had an episode – I couldn't walk properly (due to) severe pain in my back. It was, you know, very chronic and severe pain. (I had) fever, sweating and I couldn't get sleep. I (had to) crawl to the bathroom and that was the worst thing (that happened to me). Then I thought it is Brucella. And surprisingly, I got (positive for both) in my body: Brucella abortus and melitensis.*
>
> *After taking rifampicin and doxycycline, my walk became normal (again). I got the prescription myself (as) most of the (doctors), they don't know. They just give (antibiotics blindly). I had a very good book (for reference): the WHO recommendation for zoonosis.*
>
> *Then I was normal for a few months before it started again. After 5-6 months, I was with pain everyday which made my life worse. And after that, it regressed. When I walked too much, I got pain again. This time again one hour (of) fever, sweating, insomnia and very severe pain which radiates through the leg. Then I thought again I got brucellosis and I checked, so they gave me RBT (Rose Bengal Test and found the titre levels were up) 75%.*
>
> *I took gentamycin this time. I told the doctor that I didn't take streptomycin when I had brucellosis first time; just rifampicin and doxycycline. I asked him, "Can we inject streptomycin?". And, he's a doctor. He should know better than me. I said OK. So he gave me gentamycin. Again, I was normal. For two days, they gave me injections. Following three days, my (veterinarian) friends gave (the antibiotics through) IV (intravenous infusion). And then, I was normal (as the) pain was not there. (But) after 15 days, I got pain (again), but not too much now.*
>
> *I always wanted to be a vet. See we used to do artificial insemination, delivering calves and treatment of animals; all extension work…. Once I was using bare hands and my friend said, "You will get brucellosis one day", and I got it. See the problem is if you want to deliver large animals and there is any distortia, you cannot use gloves. It is very slippery.*
>
> *For the time being, I need rest. Once I take rest, my body will be all right. Once I am all right, I will go and work with animals, you know, I love animals. I am a veterinarian. I like to work with animals. I cannot give up my job. I will start wearing gloves. That I will do it when I am (back at work), so I should*

> *not get it again. Anyways, I will have some antibodies, (so) that is different. But I will start wearing (gloves, and) I will be (a) bit cautious (B2, Veterinary Officer, 22 Feb 2016).*

Even though a bit extended, the above quote from my interview with the veterinary officer highlights many of the challenges around zoonoses generally and brucellosis specifically. First, regarding the disease itself, the account sketches a vivid picture of what the personal toll of brucellosis might feel like. Because of the painful and draining nature of the disease, the affected veterinary surgeon felt unable to continue with his job. This was despite having a sympathetic employer, who had reassigned him to lighter desk duty, and colleagues who supported him through the treatment, as also a relatively young age. It is quite likely that the physical and emotional burden of a disease like brucellosis might be even more pronounced with someone in a less privileged position.

The non-specific, intermittent nature of the disease symptoms makes it difficult to diagnose, and easy to confuse brucellosis with unrelated diseases. This was indeed borne out by his experiences of being tested for diseases such as malaria and dengue, and being treated with short courses of non-specific antibiotics. Even after the veterinary surgeon arrived at a diagnosis for his condition, his treatment strategy was far from clear.

The treatment for brucellosis among humans involves the use of a combination of antibiotics for a six-week treatment to begin with. Around 10-20% cases report relapses after the first course of antibiotics, requiring another prolonged course of a second set of antibiotics (Corbel, 2006, pp. 36–8). The selection of the specific antibiotics regimen would require expertise in infectious disease management and microbiology.

In the quote above, one can sense a note of disappointment with the physicians who had to be guided by the affected veterinarian himself at crucial stages of screening, diagnosis and management. Making such decisions when in a state of distress, and which could potentially have life altering implications, would not have been easy.

Brucellosis is strongly associated with unhygienic farm conditions, which are more common among poorer farmers. On the other hand, it is quite likely that once the disease is introduced into a herd, poorer farmers are more likely to face the worst impact of the disease. This might comprise of decreased productivity of the animals to increased chances of getting sick themselves and facing a long, uncertain and expensive treatment process, if they are lucky enough to be diagnosed with the disease in the first place.

Grace and colleagues (2017, 2012b) have mapped the associations between poverty and endemic zoonoses, including brucellosis, globally as well as in India. Given the high numbers of poor livestock owners in India, it is possible that a typical patient suffering

from brucellosis might experience features similar to the veterinarian in the quote above, but whose effects might be more exaggerated in a society where even small illnesses can assume catastrophic expenses (Pandey et al., 2018).

Once we think of the suffering brought about by a silent, but widespread disease like brucellosis, the disease burden figures cited in Section 7.2 and in Table 10 start conveying impressions of a different order of magnitude and seriousness.

Being a vet is often a lonely business (Figure 29). Most veterinary surgeons do not have access to support staff as I had been used to seeing in the public health sector. They often work in small teams in remote villages, with few personal protection measures. Given the severity of brucellosis and the risks posed to them, which I discuss in the next section, translates into safety concerns for veterinarians and animal handlers.

Figure 29: A para-veterinarian vaccinating a cow at Kavla village in Surat, Gujarat.

7.3.2 Occupational risks

Continuing the discussion from the previous section, I can now understand why many veterinarians were so concerned about brucellosis. The risks to veterinary professionals,

including para-vets and animal handlers, were substantial (see Table 10). Their apprehensions about the risks from the disease were also driven by the social stigma that came to be attached to brucellosis, as explained in the quote from a brucellosis expert below:

> *Then we were getting lot of cases because we were working on brucellosis…. People used to come from other states. Because they know if you are diagnosed with brucellosis in (their) state, you become victimised.*
>
> *(Q: So there is a stigma attached to having brucellosis as well?)*
>
> *Yes, yes, yes. Accept it, accept it. You know what, it is attached to your infertility, your sanity…. It is a very painful disease. Our people are dying out of brucellosis (A8, 3 August 2015).*

The veterinary officer, affected with brucellosis, was an exception in the way he openly identified his disease and recounted his experiences to me. Brucellosis is known to attack different parts of the reproductive system, resulting in potentially embarrassing conditions such as testicular swellings. As recounted to me by some senior veterinarians, the disease is suspected to be transmitted sexually and also cause sterility within many veterinarian couples. Given this set of presentations, it is to be expected that most veterinarians have this to say about the disease, as recounted by B2:

> *They say don't disclose (your condition) to anyone. (Laughs) I said, "Why shouldn't I? Let me disclose so that other veterinarians are aware of it". (The reason is) stigma. I told you right, when they say brucellosis suddenly they think scrotal edema. They talk, "They had one, and they had one". They don't tell "I had (Brucellosis)", these people. Not most of them; most of it is undiagnosed (B2, 22 Feb 2016).*

Given the levels of apprehension around brucellosis, it is to be expected that many of these carried over to its primary intervention as well. The National Brucellosis Control Programme uses live Strain-19 vaccine, which is the most established vaccine in use for more than 60 years.

However, S-19 being a live vaccine, its use still inspired mixed feelings among veterinary professionals I met. While the veterinarians remain concerned about occupational exposure of the disease, the same anxieties are also transferred to the main intervention for brucellosis in India, which is vaccination by the live Strain-19 vaccine. The risk to vets of contracting brucellosis is non-trivial. However, this does lead to less than enthusiastic take-up of disease control strategy or, in the words of a dairy manager:

> *In brucellosis, there is live (vaccine)... So doctors, they don't get ready for vaccination very quickly. (D7, 18 Aug 2015).*

When I was starting out in my fieldwork, it was difficult to understand the precise reasons for the reservations against the vaccination programme. After all, I reasoned, I had had personal experience of vaccinating squirming infants and toddlers in the vaccination room during my medical training, and how different could it be? While I could relate to the potential for finger pricks to vets, I did not fully appreciate the risks involved until I actually observed animal vaccination camps for myself in Gujarat as well as in Tamil Nadu.

Figure 30: Administering vaccine in the field: Kavla village in Surat, Gujarat.

While it seems reasonable to me now, the first major point of difference in vaccinating human babies and animals is their sheer size and strength. Wriggling babies, at least in my limited clinical experience, could generally be immobilised by their mothers or nurses, either by physically holding them, or by swaddling them in blankets.

Vaccinating large animals, such as cows or buffaloes, required restraints of different sizes. Some villages had ramps made of parallel bars in central locations that could be used to immobilise the animal (see Figure 29 and Figure 30) during the vaccination camp, for instance. I was informed that in case of cows, their hind legs were tied together as they have a tendency to kick, whereas in the case of buffaloes, their front legs are tied together to prevent restless movements. Of course, if the vaccination takes place without ramps, as shown in Figure 31, the vet will have to seek assistance from the owner and other people to restrain and calm the constantly moving, potentially kicking animal.

The technique of vaccination is also quite different to what I had seen being practised in humans. Instead of cleaning the skin and inserting a loaded syringe directly, the vets seemed do it in two stages. After cleaning the skin, I saw them insert a plain needle through a quick slap near the neck while holding a prepared syringe in the other hand (as

can be seen in Figure 30). After calming the animal down, they held the needle with one hand and inserted a loaded syringe into it with the other hand before pressing the plunger in. I did not notice any use of gloves across multiple vaccinations I witnessed across Gujarat and Tamil Nadu.

Figure 31: Vaccinating a cow without ramps, Vellore, Tamil Nadu.

While the veterinarians and para-vets I observed seemed well-trained and experienced vaccinators, I still felt there were multiple occasions when the vaccine could have spilled over or a needle prick could have taken place when the animal moved. For many animal veterinarians who have to conduct large vaccination camps in short timelines in distant villages, I could see they had several reasons to be apprehensive, even as this leads to low coverage levels of the vaccine in many places.

For one, even though S-19 vaccine against cattle brucellosis (*B. abortus*) has had a long history, it is a live vaccine that has resulted in occasional exposures to veterinarians and vaccine manufacturers. For instance, a recent publication recalled an outbreak of brucellosis in a vaccine production unit in Argentina where 21 people tested positive for the disease, many of whom did not recall any possible exposure (Wallach et al., 2008, p. 806).

While there are risks of the vaccine itself, these are amplified by the unsafe nature of work of the veterinarians, both in the laboratory as well as in field settings. I visited a vaccine research production centre in Tamil Nadu, the IVPM[51]. Seeing the dilapidated state of

[51] Institute of Veterinary Preventive Medicine is a state-run producer of vaccines and diagnostics in Tamil Nadu (see http://ivpm.webs.com/products.htm).

infrastructure there (see Figure 32), there is no reason to believe that similar outbreaks might not be replicated in vaccine manufacturing units in India where concerns have been raised about their ability to meet WHO GMP (Good Manufacturing Practice) standards (Laxminarayan and Ganguly, 2011; Milstien et al., 2009).

Figure 32: Library at IVPM, Ranipet, Tamil Nadu

Moreover, the apprehensions of the veterinary workforce are likely also to be influenced by the attitude of their employers towards their safety. One way the state governments used to respond to occupational health concerns of the veterinarians in the past, and the way it has changed since is reflected in the following quote from a retired veterinary epidemiologist from Tamil Nadu:

> *I handled with raw hands. I washed hands in Dettol with no gloves. We were very bold in doing that and now they don't allow it. We were doing vaccination also and we gave anthrax vaccine and no protection was there and no safety. Because of this, a risk allowance was given with brucellosis and anthrax of 100 Rupees and now I think it is 400 to surgeons but not to any other staff (former veterinary epidemiologist, 24 July 2015).*

Apparently, the old way of addressing veterinarians' concerns about risks of contracting diseases was for the government to throw some money at the problem. That too was apparently limited to the more influential veterinarians only and did not extend to the subordinate para-veterinary staff.

While I discuss this point in more detail later in chapter 8, it is worth discussing the bureaucratic cultures that promote apparently cavalier attitudes to staff safety concerns. Given the risks involved in handling animals in the field, it must be difficult to motivate

veterinarians and paravets to put their personal safety at risk for the sake of meeting departmental goals. Apart from giving risk allowances, this was how one former epidemiologist used to motivate new veterinary recruits to take care of their personal safety and deliver on the programme:

> *Now that the national campaign programme is there…I keep telling (every veterinarian) it is your professional right, it is your birth right not to be infected. You have joined to attend the population. It is your personal right not to get brucellosis (A8, 3 August 2015).*

It is not only the veterinary staff who are exposed to the disease, the farmers owning the sick animals are likely to be at an even higher risk of developing the disease. Not surprisingly, farmers appear to have their own reservations about veterinary interventions that they felt had a potential for causing harm. As narrated to me by a district programme manager:

> *So…through these cooperative societies, milk samples are…collected, and after pooling of their milk, test is conducted at the (village) society level itself.*
>
> *But (the results of this test are)…not given wide popularity for various reasons because the farmer might have some kind of stigmas.*
>
> *See, supposing a farmer owns an animal, which is suffering from brucellosis—and we all know that it is of zoonotic importance—and, naturally, when other villages will come to know of this, they would immediately try to segregate the farmer and his animal. And even his milk sample will not be allowed to be pooled and collected by the cooperative (C3, 7 Mar 2016).*

In a country where the majority of cattle are housed with the poorest populations in conditions of poor hygiene (and therefore higher risks), and where there is limited ability to track movement of individual animals and enforce quarantine or culling, the official government policy has had to make several modifications to the standard preventative measures against brucellosis.

As told to me by programme managers, the focus of the newly developed brucellosis control programme is on identifying villages or farms with high levels of brucellosis instead of tracing individual, diseased animals.

In the absence of robust compensation mechanisms, very few farmers would permit the identification, quarantining or culling of diseased animals. The state, on the other hand, does not have the capacity to identify and track movements of individual animals and, therefore, does not want to want to take the risks of precipitating distress selling by farmers.

Therefore, it seemed to me that an adversarial relationship exists between the famers and the state, with both trying to outwit each other, the whole process being mediated by the veterinary services, themselves weighed down by their perceptions about the disease risks and social stigma and cooperatives who rival the government department in terms of size and visibility.

The farmers are trying to secure their livelihoods and ensure animal productivity with the resources available to them. In the absence of social and legal sanctions for slaughter of diseased animals, they might not want to be burdened with the upkeep costs of a non-productive animal in a capital intensive industry. On the other hand, it is in the government's interests to keep its citizens in the dark so as to prevent any undue attention to the disease.

The veterinarians have mixed feelings about the intervention, promoting its advantages, yet privately being uncomfortable with the increased risks (to themselves) of delivering it. As I explain later in the chapter, this is operating in an environment with limited understanding about the burden of disease and where an honest discussion around cattle trade cannot be initiated by the government given the politics of cow protection being practised by it, also discussed later in the chapter. The next section examines the framing of brucellosis as a neglected diseases and analyses the characteristics of neglect in the case of brucellosis.

7.4 NEGLECTED DISEASES: FRAMINGS AND DIMENSIONS

> *Once I heard a Joint Director of (King Institute[52] at Guindy) telling – (that) in (over 100) years of (the) Guindy (research centre's existence), there was not even one record of bovine tuberculosis in human beings whereas there are hundreds of human tuberculosis in cows* (A8, 3 August 2015).

As the well-known aphorism goes, an absence of evidence cannot be considered to be an evidence of absence. Unfortunately, as shown in the quote above, this truism is often forgotten in the case of diseases that are already neglected such as bovine tuberculosis, or brucellosis. I will attempt to expand upon this theme in this section and demonstrate how scientific understanding of brucellosis is constructed in a way that neglects several aspects of the disease and the implications of this neglect on decision-making around the disease.

Citing some of the evidence presented earlier in the chapter, I will demonstrate how the limited information regarding the actual disease burden led to ignoring other, possibly

[52] A specialist infectious disease research centre and hospital in Guindy area of Chennai, Tamil Nadu.

more important aspects of brucellosis as well. For example, despite a number of studies demonstrating high levels of brucellosis in livestock and pointing to high levels among exposed humans too, there is limited consensus within the veterinary and public sectors about acknowledging the existence of a problem.
As is the case in other diseases (Leach et al., 2010a), even within the animal health sector, it appears some livestock diseases get more attention that others, in research as well as policies. Lastly, I will examine the association between disease framings and resultant policy gaps.

7.4.1 Dimensions of neglect

As discussed earlier, the precise disease burden of brucellosis remains unclear despite several decades' worth of research that has been conducted in India. One reason is the difficulty to generalise from these estimates because many of these studies are laboratory-based, and they do not report population denominators from which a sample has been drawn, thus making it difficult to estimate incidence and prevalence rates. In addition, most studies estimate disease loads by looking for immune response among livestock using simple tests that cannot distinguish between vaccine-promoted immune response and the disease-provoked positives, so they cannot make a definitive claim either about vaccine coverage or disease incidence.

While a big range for brucellosis positivity for different livestock species is listed in Table 9, it nonetheless allows us to claim that there are pockets within India with extremely high levels of brucellosis in almost all livestock species, including cattle, buffalo, sheep and goats.

Compared to the animal sector, there is even more scattered and patchy evidence around brucellosis burden among humans in India. However, as discussed earlier, the limited data and inferences drawn from contributing factors would indicate a much higher burden of brucellosis than is generally recognised.

The above discussion around the limited extent and scope of research that exists around brucellosis logically leads to the question – what explains a lack of coherent picture of brucellosis despite indications of its established nature in India? I cite three possible explanations for the continued policy neglect of brucellosis that has prevented the development of an effective disease control strategy. These include the professional cultures of the involved disciplines that encourage their practitioners to focus on specific, narrow aspects of the problem, or indeed, allow them to ignore many others as well. I also draw parallels from the neglected diseases literature to cite structural factors that could contribute to such neglect by leading institutions. I carry the discussion forward to the

next section on the politics of disease control where I cite additional, more political factors that could also explain the reason for limited visibility of brucellosis on policy agenda.

7.4.2 Professional cultures

As described in Section 7.3, I found the members of the veterinary community, particularly the practitioners, to be quite concerned about the threats brucellosis poses to their profession as well as to the farmers and animals themselves. The veterinary researchers have responded to the disease by carrying out sero-prevalence studies, which measured the immunity against brucellosis among animals and exposed humans. As a result, we now have a substantial body of literature that documents levels of brucellosis circulation as reported by different laboratories in the country. However, most of these studies suffer from the veterinary predilection for conflating microbiology and public health, which prevent the findings of most of the studies of either giving population-based rates or their findings to be generalized to a larger setting.

During my fieldwork, I called upon a professor of veterinary public health whom I knew from before. I commented on the overlap of microbiology with veterinary public health and asked him to explain how his discipline could be distinguished from the fields of microbiology and preventive medicine as taught in his veterinary college. He was very clear in his explanation that while all zoonotic pathogens were covered under the subject of veterinary public health, all other pathogens were covered by the other disciplines (Field notes, B6, 25 Feb 2015).

A similar conflation of epidemiology and microbiology is reflected in the brucellosis publications and activities of the National Institute of Veterinary Epidemiology & Disease Informatics (NIVEDI), the national centre expressly mandated to work in veterinary epidemiology. NIVEDI is among the newest research centres under the institute of Indian Council for Agriculture Research, formally established only in 2013, another testament of relative novelty of the discipline of epidemiology in animal health sector. In contrast, the public health analogue of the institute, National Institute of Epidemiology (NIE), sponsored by the Indian Council for Medical Research (ICMR) was established in 1999 and now runs a school of public health.

There are several key papers on brucellosis epidemiology from NIVEDI and its precursor institute (Isloor et al., 1998; Renukaradhya et al., 2002; Shome, 2014). Other publications from NIVEDI's recent work on brucellosis are available at http://www.dbtbrucellosis.in/publication.html. As even a quick perusal of the titles will demonstrate, almost all these papers are based upon laboratory sampling with very limited scope for epidemiological contextualisation. The inability to draw in

epidemiological expertise in their work means the veterinarians are not able to provide a big picture quantification of the disease burden. As Ijaz *et al*. (2012) state in the context of International Health Regulations, "what gets measured, gets done".

The situation on the public health side, in the case of brucellosis, is no less alarming. The operating principle here seems to be, 'since we have not heard about it, we do not need to look for it'. This was best exemplified in my interactions with the chief disease surveillance officer of Gujarat. Coincidentally, he was a microbiologist himself and so more aware about brucellosis than might have been the case had he been trained in another medical discipline. While he recognised the importance of looking for brucellosis, citing his own clinical training, he reported there was no data on human brucellosis because no tests were being done. When prompted about high levels of disease data being reported from animals, he said:

> *Now that you are asking me this question, it definitely seems plausible to me that there might be brucellosis in the state. I remember during my residency in microbiology, we had charts in our labs instructing us how to process brucellosis tests, so I am sure it must have been done in those times, but somehow got discontinued... I will put in an indent request to procure brucellosis test kits this year to see if we can test samples (E10, 24-Aug-2015).*

In a classic illustration of challenges faced in neglected disease control, it is quite possible that the public health researchers are missing the disease simply because they are not looking for it. As researchers elsewhere have found, brucellosis is one of the most common diseases misdiagnosed as malaria (Crump et al., 2013). Investigations in India hint at a similar underestimate as well (Kadri et al., 2000; Kejariwal et al., 2014; Mantur and Amarnath, 2008; Pathak et al., 2014).

I realise it is probably simplistic to generalise the work of entire disciplines in a single assertion. Even as the bulk of studies have not progressed beyond sero-prevalence studies, many veterinarians as well as public health researchers recognise the importance of social and political factors in disease spread and control. In addition, several researchers have pointedly questioned the neglect of larger systemic factors around brucellosis and other neglected zoonoses in the Indian subcontinent.

For instance, researchers have consistently highlighted the associations between poverty and zoonoses in different countries (Grace et al., 2017; Jones et al., 2013; Perry and Grace, 2009). Several Indian researchers have highlighted the importance of brucellosis as a zoonosis (Kurian et al., 2014) and suggested systems and policy research needed for their control (Sekar et al., 2011). In their review of challenges facing brucellosis policy-making

in India, Kumar and Singh (2013) repeatedly highlight the significance of social and political factors that need addressing for achieving brucellosis control, which I will discuss in the next section.

However, despite these discussions, brucellosis continues to face official apathy at multiple levels. This was only partially redressed when the new national disease control programme for brucellosis was launched in 2011. While the programme faces major conceptualisation and implementation challenges, even this policy announcement is likely to have precipitated as a result of an urgent crisis in the dairy sector, as explained later in the chapter.

7.4.3 A case of neglected diseases syndrome?

In addition to the local factors already discussed, there could be a larger systemic issue responsible for the continued neglect of many zoonotic diseases, such as brucellosis. Citing Shaw (2008), Coker *et al* (2011, p. 327) cite the following explanations for neglect of zoonoses:

> *First, veterinary services had been given responsibility for control of these diseases, but had neither the farm-level economic incentives nor the societal resource allocation to fulfil this role. Second, zoonoses in both human beings and animals are generally underdiagnosed. Third, zoonoses tend to affect rural, often poor, people with poor access to health services. Fourth, mechanisms to control and to restrict food-borne diseases are difficult and complex.*
>
> *We might add to this list several additional reasons: including the challenges of interdisciplinary collaboration…and the upstream nature of prevention activities and their temporal and causal distance from human consequences.*

In a remarkable illustration of the above factors, the international agencies that are mandated to provide technical leadership in public health agenda setting, such as the WHO and OIE, themselves do not seem immune from neglect suffered by diseases such as brucellosis. For instance, the priority accorded by WHO to brucellosis is reflected in the paucity of content on its website, compared to its page on rabies—a disease likely causing less than 10% global mortality than brucellosis, but included in the official list of 'neglected diseases'[53] (see Figure 33).

[53] Visit http://www.who.int/neglected_diseases/diseases/en/

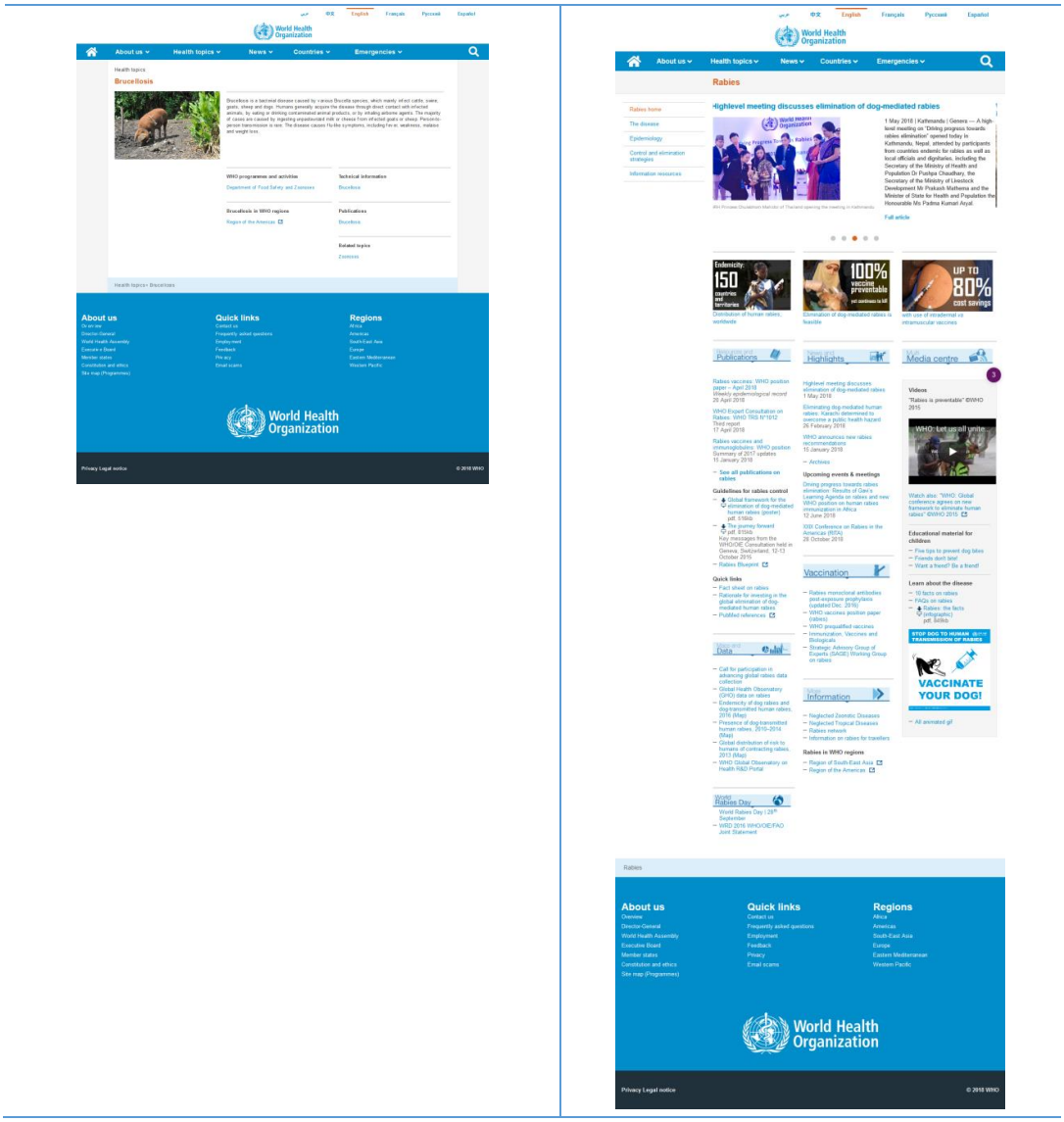

Figure 33: Screenshots of WHO pages on brucellosis and rabies [54]

The lack of activity in brucellosis is also reflected in the publications posted on its website, which does not appear to have been updated in more than two decades.[55]OIE does have detailed guidelines with regards to food safety and for controlling the spread of brucellosis in its flagship publications, the Terrestrial Manual & the Terrestrial Code, aimed at veterinary public health departments (OIE, 2018a, 2018b). However, there is surprisingly limited discussion on epidemiology and spread of enzootic brucellosis. The OIE website only catalogues a Disease Summary Card and not a Technical Card for the disease, which I have interpreted as an indication that the organisation does not identify brucellosis as among the priority 34 animal diseases of importance to the organisation. More

[54] URLs: http://www.who.int/topics/brucellosis/en/&http://www.who.int/rabies/en/; Accessed: 10 June 2018.
[55] Visit http://www.who.int/zoonoses/resources/brucellosis/en/

surprisingly, the OIE lists brucellosis as now being "closer to elimination" with little justification (OIE, n.d.).

Based upon what I have read and heard about brucellosis control in India, this seems to be another proof of the disease burden of brucellosis not translating to corresponding political priorities. Guidance from agencies such as WHO and OIE frequently serves as templates for national governments to develop their own response strategies. It is no wonder that in the absence of intellectual leadership from these agencies, the national brucellosis control strategy seems to be floundering.

The case of brucellosis also serves a useful illustration of the neglect faced by many diseases of poverty, including zoonoses. As pointed out by Hotez (2008b) and Coker *et al.*(2011, p. 327), when diseases affect marginalised and underserved communities and are inherently difficult to diagnose, there will be little disease information available. This can lead to a self-perpetuating cycle of neglect (see Figure 34).

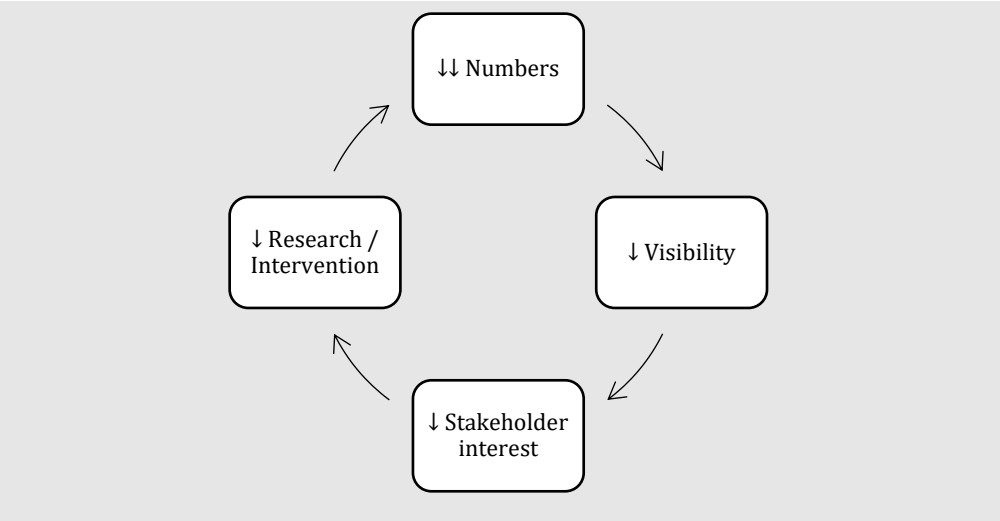

Figure 34: Self-perpetuating circle of neglect for ignored zoonoses

This absence of clinical, epidemiological and economic numbers affords poor visibility to the disease in popular and specialist discourse. This is both an indicator as well as a factor for decreased interest by stakeholders who could advocate for increased investments in the disease. None of the key opinion-makers such as researchers, donors or technical institutions might be interested in taking up the case of a disease that does not seem to exist.

Global level disease burden assessments, such as Pappas *et al.*(2006) for brucellosis or Müller *et al.*(2013) for bovine tuberculosis, ignore disease presence in India while arriving at conservative estimates. These estimates might be methodologically sounder, but the ethics of whitewashing disease presence might be highlighted, especially when such

estimates lead others to conclude that the reported disease does not exist, or allows an agency like the OIE to claim that brucellosis is now close to elimination.

In the absence of any disease information, discussions or interests expressed by donors to support research or interventions in the disease, there is even lesser chance of any further data to emerge about the disease.

I realise that this cycle does not represent the full picture. Not all research and intervention need to be donor funded; individual clinicians and researchers can continue some work on diseases, and public pressure can be a great mobiliser of policy attention as well as interventions. A second caveat is that the mere presence of numbers does not automatically translate to policy attention. Diseases with smaller numbers but framings that are more attractive might achieve greater notoriety (Leach et al., 2010a).

Indeed, according to the 'multiple streams' explanation of agenda setting, it is the interplay of political opportunism with framing of problems and solutions that is likely to result in substantial policy innovations (Kingdon, 2010; Zahariadis, 2007). Nonetheless, such a schema describes the process by which diseases become to be neglected and tremendous odds are required for them to gain recognition on the policy radar. Building upon this discussion, I now analyse the unique nature of politics that helped push brucellosis onto the policy agenda, but which, nonetheless, also acted to restrict the scope of interventions envisaged for brucellosis control in India.

7.5 POLITICS OF BRUCELLOSIS CONTROL

Politics cannot be distinguished from the production and use of knowledge, or the everyday practices of professionals (Jasanoff, 2011). Therefore, even as the earlier sections in the chapter focussed on specific aspects of politics, I aim to use this section to examine the discussions around the national bovine brucellosis control programme launched around five years ago.

However, I want to preface the discussion on programmatic strategy by analysing the political significance of bovine in India. I argue that cattle draw their importance from two distinct sources – first, from the political imagery of cow as a sacred animal and second, from the economic contributions of the dairy sector in India.

I then introduce the current brucellosis control strategy and explain how the political capital surrounding the cattle and dairy industry might have resulted in the way in which brucellosis control strategy came to be shaped in India, including limiting the effectiveness of the programme.

Lastly, I examine the role of key stakeholders playing a role in brucellosis control. I describe their stance on brucellosis control as explained by their role in the political economy of brucellosis.

7.5.1 Importance of the cow in India

While doing fieldwork among epidemiologists and clinicians, I had repeatedly to justify my research interests. However, even if I were harbouring any doubts about the evolving nature of my research, the newspaper headlines were enough to convince me about the importance of factoring in politics while analysing the performance of public health programmes.

Figure 35: News reports related to cows; 10-11 Feb 2016

The newspaper clippings shown in Figure 35 are all from front-page stories that appeared in the local edition of the leading national English broadsheet, the *Times of India*, while I was visiting Surat for my fieldwork in Gujarat. Within a span of two days (10-11 February 2016), the daily newspaper published three stories relating to cows in Gujarat. These stories covered aspects of concern on welfare of cows being abandoned to eat plastics (Times News Service, 2016), a sense of nationalistic shame that indigenous cattle breeds had to rely on imported semen for preservation (Dave, 2016), and sheer politicking by a right-wing politician keen to whip up sentiments about banning cow slaughter (Times News Network, 2016b).

The three angles of the 'cow stories' covered in the newspaper serve as convenient illustrations of the unique place cattle have come to occupy in the political discourse of present-day India, and also help me structure the rest of the discussions on the subject. I

present an explanation of the political symbolism of cows in national political discourse and the economic contributions made by the dairy industry, which is based upon cattle (and buffaloes). While cow-welfare is supposed to be an integral component of both chains of discussions, I will argue that cows and their health are secondary, and distinct, to the political and economic capital that accrues from them.

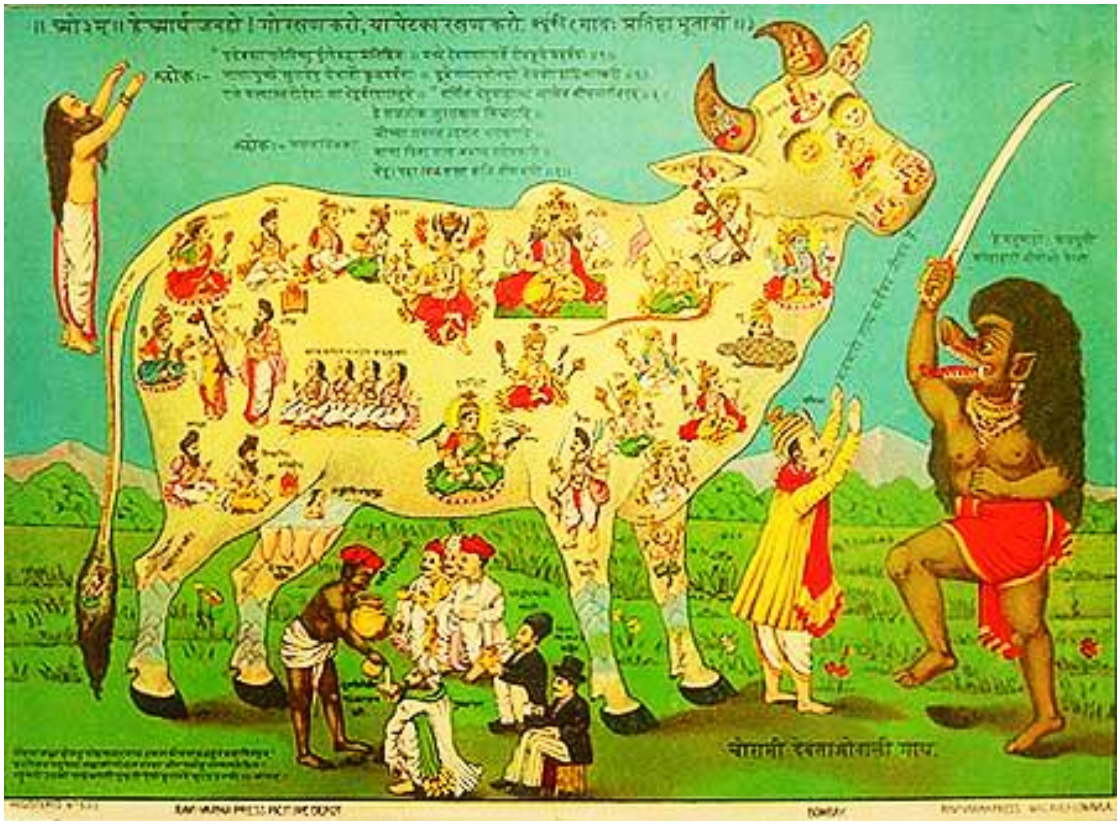

Figure 36: "The Cow with 84 deities" by Ravi Varma Press (1897, Life: 1848-1906)[56]

Political imagery of the cow

> *By about the last quarter of the nineteenth century the cow in India had emerged as a political animal…the cow symbolised the resistance of traditional Indian religious values to the values of secular progress. The cow symbol was used to domesticate modern Indian politics (Parel, 1969, p. 179).*

As reflected in the turn-of-century lithograph in Figure 36, cows had begun to be used as a metaphor for a certain version of Hindu philosophy much before Independence. In this particular picture, cows are described literally as embodying divine characteristics of 84 different deities and nourishing all communities, exemplified by the western-style-dressed European, the Parsi and the token bearded Muslim. The sword-flashing demon was supposed to represent all that was wrong in a modern, meat-eating society. According to some scholars, lithographs like these were quite popular for most of the twentieth century,

[56] Source: Under public domain, sourced from (Wikimedia Commons contributors, 1897)

with their religious iconography becoming an important part of developing national religious identity (Mohanty, 2015; Pinney, 2004). In this particular case, because of the potential of the Muslim or untouchable butchers to be misrepresented, the colonial government got the publisher to remove the image in subsequent prints (Pinney, 2004, p. 112).

The alluring power of this imagery has not faded. In fact, it only appears to have been reinforced in recent times. In their summary of key political developments in India in 2017, scholars Chhibber and Jassal (2018, p. 92) state, "The cow emerged as an important motif of contentious politics in the country". They refer to the rise in political rhetoric against cow-slaughter, a spate of public lynchings of suspected cow smugglers by vigilante gangs of 'cow-protectors', as well as a series of government orders restricting the sale and transport of cattle.[57] The political idiom of preventing cow-slaughter became a sure-fire way to polarise citizens and categorise them as vegetarian upper caste leaning Hindus versus others, a category which might include Dalits, Muslims and Christians (Sarkar and Sarkar, 2016).

Even a state like Tamil Nadu did not escape being politicised around cows, albeit for different reasons, when the Supreme Court banned the organisation of traditional bull-taming festival, the *jallikattu*.[58] At a time when the leadership of both the key political parties in the state were in a state of transition, it became an opportunity for alternative forms of popular mobilisations, and ultimately led to the government reinstating the festival (Kalaiyarasan, 2017).

As exemplified in the tweet depicted in Figure 37, people advanced a mix of arguments to make the case for continuing the bull-taming festival. While for some, a traditional festival originally confined to a few farming communities became a question of Tamil identity, to others, *jallikattu's* importance lied in its role in preserving indigenous breeds and promoting healthier milk (Kalaiyarasan, 2017; Sudeepkumar et al., 2013).

The rhetoric of cow protection, inevitably, was not able to keep pace with the public sentiments it mobilised. As cattle vigilantes tightened their grips on the national highways, the transport and sale of cattle fell dramatically in a way that started affecting the viability of the dairy sector. While young female calves remain in demand, the male calves and

[57] A reading list of key news stories around the issue of beef-bans and anti-cow-slaughter laws is available at https://scroll.in/article/833901/reading-list-getting-to-the-meat-of-the-matter-on-cow-slaughter-and-indias-beef-politics.
[58] A traditional harvest festival, *Jallikattu* involves the release of a bull into a crowd of young men who attempt to hold onto the hump and bring the bull to a stop (https://en.wikipedia.org/wiki/Jallikattu).

older cows started being abandoned so much that in some cases, they were referred to as having gone feral and attacking village crops. It is likely that the cow protection laws might lead to a drop in cattle trade itself in favour of equally productive, but less politically sensitive buffaloes (Chari, 2016; Daniyal, 2017; Rajan, 2017).

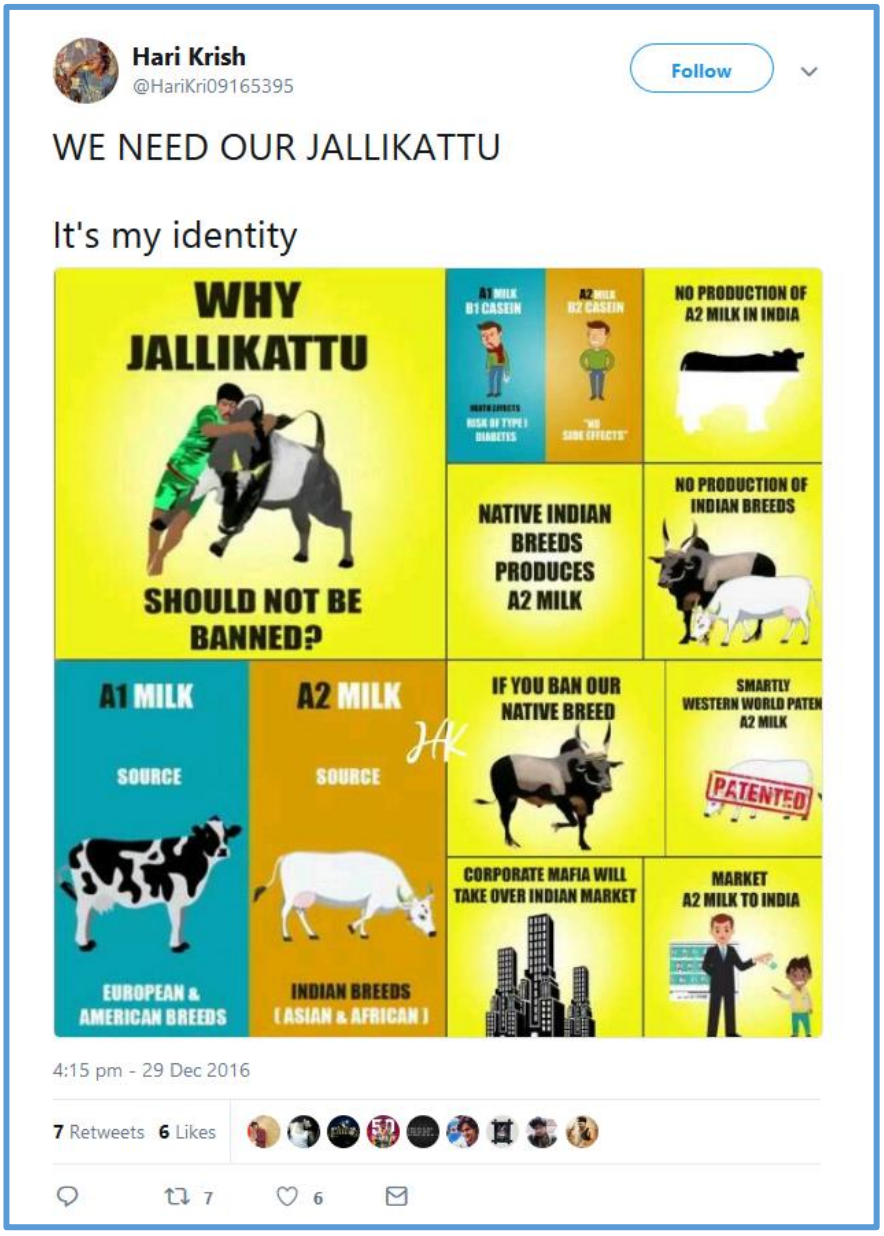

Figure 37: A tweet explaining support for Jallikattu[59]

The above discussion establishes the nature as well as significance of the cow as a political metaphor in India. Having accumulated such political capital, it is reasonable to expect a high level of prioritisation for efforts to control a disease that affects cows. However, just as the politics of protecting cows had likely not been about the cows alone, the impacts of

[59] Source: https://twitter.com/HariKri09165395/status/814505185296941056, Accessed 31 May 2018

a bovine brucellosis control programme would never be felt by cows alone but would also affect other stakeholders in myriad ways.

Such a political profile of cows should facilitate raising the profile of a cattle-specific programme. However, on the other hand, heightened political sensitivities around cattle would also serve to restrict the scope of activities within politically acceptable confines. In the case of a brucellosis control programme, this would mean that culling diseased animals would be an unlikely intervention, as would the identification of a diseased animal, which might favour distress selling. Arguments around harnessing the economic potential of a religiously revered animal present their own contradictions, some of which are discussed below.

Economic aspects of dairying in India

Following the green revolution in India in the 1960s, possibly the most significant agricultural development in independent India came in the form of Operation Flood. Over a period of 25 years starting from 1970, the Indian government, with international aid assistance, invested in developing a cooperative-led procurement and supply model for milk and dairy products all across India (Achaya and Huria, 1986; Cunningham, 2009).This rise in dairy production is reflected in Figure 38, which shows a consistent increase in per capita availability since 1970 and has made milk the largest agriculture crop in India, with a market value of $ 65 billion in 2014 (Gujarat Co-operative Milk Marketing Federation Limited, 2015, p. 6).

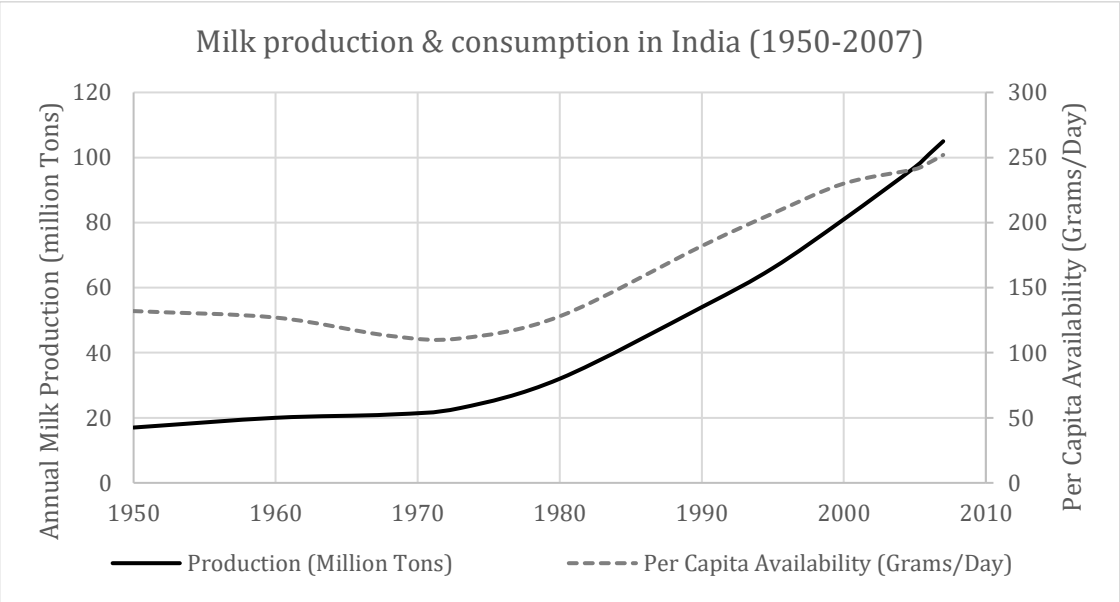

Figure 38: Increase in milk production and consumption following Operaton Flood (Cunningham, 2009, p. 16)

The cooperatives engaged a large number of landless farmers into rearing cattle and established centralised milk processing and chilling facilities, thus increasing consumption and safety of milk in urban markets and providing economic benefits to rural farmers. While there is no denying the economic impact of the dairy cooperative movement in Gujarat, which claims to have membership of 3.6 million households spread across more than 18,000 villages (see Figure 39), it has faced a long standing critique of consolidating local power hierarchies by promoting growth of landed farmers at the expense of landless and lower caste communities (Baviskar and George, 1988; Ebrahim, 2000; Rawal, 2003). With the establishment of a neo-liberal political regime in the state, recent scholarly and journalistic investigations have highlighted how these political dynamics have become even more deeply entrenched in the Gujarat cooperatives (Rajshekhar, 2018a, 2017; Scholten and Basu, 2009).

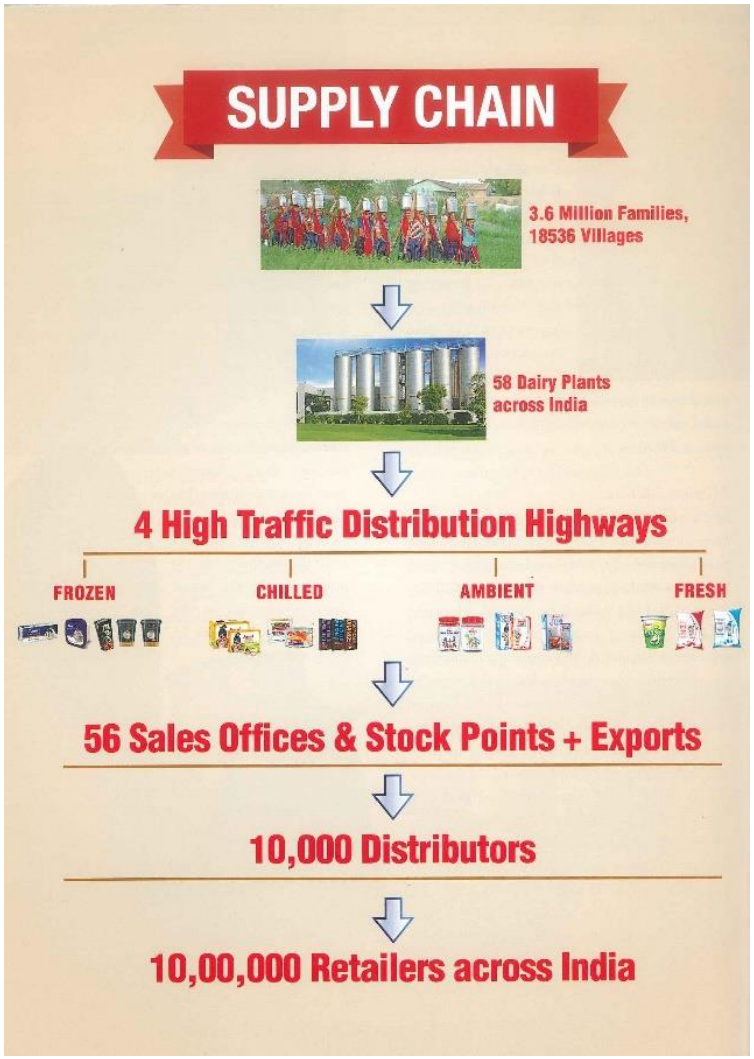

Figure 39: Gujarat dairy co-operative supply chain[60]

[60] From 2015 Annual report (Gujarat Co-operative Milk Marketing Federation Limited, 2015, p. 22)

But there is no denying the size of the dairy cooperatives in the state. The financially sustainable model of the cooperatives helped them employ a large veterinary workforce, such that in states like Gujarat, they have become more dominant players than even the state animal husbandry department. According to a cooperative officer:

> *Our extension work is so huge that we have almost 1200-1300 people working in the villages regularly…. We have equal to 1200 extension workers, who (run our) extension education programme, in (which) we talk about animal health.*
>
> *(More vets were employed by the cooperatives) than by the agencies…. There are 923 vets this year (D7, 18 Aug 2015).*

This means that the costs and impacts of brucellosis and its interventions are felt not only by the animals and their owners, but also involve large marketing bodies negotiating sales worth billions of dollars in thousands of retail outlets within India as well as internationally (Figure 39). Therefore, given the size of the dairy industry, these have the potential for economic repercussions in markets outside the state. This added level of complexity will necessarily need to be addressed in any discussions related to brucellosis in Gujarat and other Indian states.

> *Gujarat produced about 10 million tonnes of bovine milk in 2012-13 – which is around 1.3 per cent of the aggregate world milk production and 7.6 per cent of the country's production. What's more, the output is increasing at about five per cent per annum (NDDB, 2013, p. 44).*

In Gujarat, since the ownership of animals is ultimately in the private sector, the state government does not enjoy the same level of control as it does in Tamil Nadu. Moreover, given the rapidly expanding dairy industry in Gujarat (with sales projected to increase from $3.4 billion in 2014 to $8 billion in 2019 (Gujarat Co-operative Milk Marketing Federation Limited, 2015, p. 20), there are powerful interests concerned with the health of cows that go beyond veterinary health, farmers and cooperatives, to the extended ecosystem of food processors, traders, financers; all possessing at least some political clout.

The economic important of cattle, thus, both increases the profile of the sector as well as the risk aversion among the major actors to any discussion that might have even a marginally negative impact on the industry. This is especially so, because India has been negotiating with EU for decades on relaxing food safety-related non-trade barriers to allow dairy imports from India, but "which India has never been able to break" (Debroy, 2005; Gujarat Co-operative Milk Marketing Federation Limited, 2015, p. 10). Any adverse publicity regarding the food safety standards in the dairy sector are likely to adversely

impact these negotiations, as well and therefore creates further incentives to quieten discussions around brucellosis in the country.

This might explain their reluctance to acknowledge the presence of a brucellosis like zoonoses, which is food-safety as well as an occupational health issue. This resistance is best reflected in the below quote from a dairy manager who, when confronted by reported figures of brucellosis in Gujarat, tried to deflect the problem by citing another state as the origin of the problem:

> *There are many cases of brucellosis in northern states. The animals that have come to us from there, because of that only, it has come to our Gujarat. Otherwise, earlier I had never seen a case. Because of imported animal only it has spread. Now we have asked the farmers to not get animals from outside (D7, 18 Aug 2015).*

7.5.2 National brucellosis control programme

The national brucellosis control programme was launched less than five years ago. The disease had been a concern with veterinarians for a long time. However, there was little consensus about how to control the problem because of the restrictions against animal slaughter and the risks posed by the vaccine.

According to some respondents who used to work on brucellosis in the last few decades, brucellosis was popularly considered to be a self-limiting disease in animals. This was because usually after 1-2 abortions, the cows became productive again. Even if the once-infected animals became carriers, since individual animal testing is not done and because brucellosis is easily destroyed in pasteurisation, it was not a priority for the government.

Therefore, there were not many efforts to change the status quo, except to insist on consumption of packed and pasteurised milk. However, this changed once the spread of brucellosis became such that it started hurting the productivity of the dairy sector. According to an officer formerly involved in calf rearing programme:

> *As far as brucellosis is concerned, nobody was bothered, or is bothered. The only people really bothered are those who are producing semen (for artificial insemination), because those bulls have to be brucellosis-free. If that herd has to be kept disease free, every village within a radius of 10 kilometres is vaccinated 100 percent by the same station.*
>
> *So, we reached a stage where we could not get disease-free, brucellosis-free bulls for the semen station. That is when everybody woke up. Otherwise, brucellosis was not on any agenda.*
>
> *There were villages where you could not find disease-free bulls...if one household has brucellosis, I can't pick up (bulls) from that whole village. Now I have invested in that village, by putting this expensive semen into those female, and by the time, I go to collect the calf, I know I cannot collect it.*

> *Then I start all over again. First I have to test all the animals in that village, (ensure it is) disease free and then go...so till we started collecting bull calves in a serious way… Because productivity was not on anybody's agenda (then), nobody took brucellosis… seriously. (D4, 19 Aug 2015)*

I met several scientists, all now retired, who recalled their interaction with key Indian Council of Agricultural Research (ICAR) officers, or presented at key meetings at ICAR, which, they felt, could have convinced them to initiate the national control policy. Whatever might have been the immediate precipitating factor, once the seriousness of brucellosis as a threat to dairy productivity started being recognised, the veterinary administrators had to devise a brucellosis control strategy that was feasible in the Indian political context.

A guidance publication from the Veterinary Council of India defined the political and practical constraints for a national brucellosis control strategy:

> *Brucellosis control and eradication is best achieved by a combination of vaccination with test and slaughter of positive animals. Exclusive test and slaughter strategy should be limited to the regions/ areas with very low herd prevalence supported with well-established veterinary services, adequate budget and political will.*
>
> *In all other situations, vaccination should be considered as a basic control tool. Since test and slaughter is not practicable in India, eradication should not be targeted leaving control of brucellosis the only option. The whole population vaccination should be considered, where the herd prevalence is high and control on animal movement is not effective* (Kumar and Singh, 2013, p. 7).

Social context of livestock rearing

The sheer number of poor livestock owners in India illustrates the financially precarious nature of most livestock keeping, despite the achievements of the cooperative movement (Grace et al., 2012b). And, as a veterinarian described earlier, other villagers might not prefer pooling milk with animals from a farm with suspected brucellosis. Combined with the relative lack of veterinary services, it is easy to see why farmers might want to cut their losses by resisting diagnoses in their animals and consider quickly selling off animals suspected of carrying a disease rather than incur financial losses.

> *And, if it (the animal) has got brucellosis, then you have (no option) but to sell it. In our country, an animal with T.B. or any other disease cannot be destroyed, you have to carry the disease in your country. So, we will always be a nation of endemic diseases (D4, 19 Aug 2015).*

This is why the guidelines for national brucellosis control programmes advise against identifying diseased animals and instead recommend testing of pooled milk samples. They suggest better farm hygiene and segregation of animals. The recently convened Brucella

free network, convened by NIVEDI, perhaps realising the limitations of this strategy in achieving elimination of brucellosis, has called for identification and tracing of diseased animals in its pilot project (Department of Biotechnology and Veterinry Council of India, 2016).

Small ruminants and other animals: A big gap

> *Goat plays a significant role in providing supplementary income and livelihood to millions of resource poor farmers and landless labourers of rural India. Small ruminant rearing ensures self-employment and acts as a cushion in distress situations like drought and famine (Department of Animal Husbandry Dairying & Fisheries, 2017, p. 1).*

The above quote can easily be applied to sheep-rearing as well. India is supposed to house the biggest goat population and is the biggest producer of goat milk globally, largely for domestic consumption (Department of Animal Husbandry Dairying & Fisheries, 2017, p. 1).

Smaller animals such as sheep and goats are generally owned by poorer households as a supplemental income source. Despite their size, the sheep and goat keeping sector is not organised in the same way as the dairy cooperatives (Kumar and Pant, 2003; Nandi et al., 2011). Most small animals are owned either in small numbers in backyard farms, or by nomadic communities which practice open grazing, as shown in Figure 40 (Nandi et al., 2011; Prasad et al., 2013; Singh et al., 2013). As a result, this sector does not command the same level of visibility as more organised and stable farms.

Figure 40: Leading a flock of sheep to pasture in Surat, Gujarat.

The main vaccine of choice, S-19, is unfortunately not effective against the *B*. *melitensis* strain of brucellosis and therefore these species are not targeted upon in the current version of the brucellosis control programme. The vaccine for *B. Melitensis* (Rev.1) has not been introduced by the national programme so far, apparently because of challenges with its availability (Kumar and Singh, 2013).

In the relatively more organised dairy sector, milk is pasteurised and thus safe from brucellosis. On the other hand, goat milk is primarily used for domestic consumption, which means there are more chances of melitensis-caused disease. Given what we know of the presence of melitensis in the country, it is very likely that the more relevant brucellosis variant (for human health) is not being addressed in the current efforts and must constitute a significant burden, mainly in families which can least afford such an illness.

7.5.3 Brucellosis: A 'hushed up conspiracy'

Thus, the key message from this section would be about the strongly political nature of brucellosis – both because of the species associated with it, as well as the interventions devised against it. This makes brucellosis hard to talk about and challenging to control.

Earlier I established the significance of cattle to political as well as economic debates in India. The importance of cattle is felt at the level of individuals as well as at a societal level, in different ways. Many people in India have multiple associations with cows; they could be worshipping the divine presence in the animal, or could be rearing it for the economic benefits, or, in case of many other, might obtain some nourishment from the cow.

The cow is perhaps even more important at a macro level, because of its used in political discourse as a motif. An equally significant aspect of cattle is the size of economic sectors built upon the dairy, leather and meat industries sourced from the animal[61]. The size of economic investments and the large number of actors, including cooperatives as well as corporates, riding on the animal ensure that the government takes a conservative approach towards the sector.

The problem with the huge prominence of cows in the national imagination, at least as far as brucellosis is concerned, is that a single animal subsumes the attention that should also go to other related animals and interventions: for instance, buffalo, which is an equal

[61] India is among the largest exporters of beef (carabeef, drawn from buffalo, a less politically volatile animal), as well as leather products (Ramkumar, 2013). For various reasons, these two primarily export-oriented industries occupy less space in political discourse and have therefore not been discussed in this chapter. But it is likely that, at least in the case of meat industry, it would have a similar influence on brucellosis discourse as does the dairy industry.

contributor to the dairy industry as well as to the export-oriented meat industry. Other obvious examples are the smaller livestock species of sheep, goat, and to a lesser extent, pigs, all of which are reared by poorer and lower caste communities for meat.

Having discussed the political significance of the species associated with the disease, the interventions against brucellosis provide additional challenges to the programme managers. Tracing and culling diseased animals is neither cost efficient for a widely spread disease like brucellosis in India, nor politically suitable. The key interventions against brucellosis, therefore, are surveillance for diseased animals and their quarantining to prevent them from spreading the disease and vaccination among the healthy animals to prevent them from catching the disease.

Since most farming livestock in India are not tagged, it is not possible to trace individual animals. Moreover, since identification of individual diseased animals is likely to result in distress selling, the official national policy is to conduct the screening at village or farm level in pooled milk samples. Therefore, quarantining of sick animals becomes difficult to achieve as well. This leaves us with the last and strongest intervention measure against brucellosis which has helped many countries control brucellosis – vaccination. While the vaccine itself is quite effective, the animal health professionals do not like handling it because of increased risk of catching the disease, which carries with itself another level of stigma and challenges.

Thus, to summarise, the cooperatives prefer pasteurising milk to considering the presence of brucellosis among their livestock. Farmers likewise, because of economic as well as social reasons do not want to be told that their animal has the disease. The veterinarians are fully aware about the disease in animals, but do not like to discuss their vulnerability to the disease because of the social stigma attached to it.

Brucellosis, therefore remains an intractable political problem, in the present circumstances, and the reluctance to discuss the disease, surely points to a hushed up conspiracy as an apt metaphor to describe it.

7.6 COLLABORATION

Even as brucellosis is a major challenge for veterinarians and is likely a significant illness among humans too, its framing remains as that of an animal health issue. It is this lack of awareness among the human health sector that the veterinarians appear to be most exercised about. In fact, a major grievance against the public health sector held by many of the veterinarians I spoke to was not about the lack of collaboration or lack of activity on the public health front for brucellosis. Rather, it was something even more basic—the

veterinary public health community was constantly disappointed at the apathy exhibited by the public health professionals as far as brucellosis as concerned, a sentiment echoed in this WHO publication:

> *The veterinarians are often at the front line of dealing with zoonotic diseases, but receive little support from medical colleagues; there is a lack of awareness and responsibility for human health-related problems. There is a real need for integration of veterinary and medical sectors for disease prevention. Veterinary staff also lack the facilities for efficient diagnosis (WHO, 2006, p. 7).*

As I mentioned earlier in the chapter, almost all veterinarians I met with had had a personal association with someone who developed brucellosis, and who had to prompt their physician to test and diagnose brucellosis.

On the subject of intersectoral collaborations around brucellosis, I found across the board there was a strongly felt need for animal-human health collaborations within the veterinary sector, on the lines of the sentiments expressed in the principal WHO publication for brucellosis control:

> *…the disease in man can only be prevented effectively by elimination of the animal reservoir. This necessitates a close interaction between the medical authorities concerned with public health authorities on the one hand and the veterinary authorities on the other.*
>
> *This collaboration is only the first step in establishing an effective control programme. For a successful outcome, all sections of the community need to be involved in the process and to lend their support (Corbel, 2006, p. 68).*

However, when probed further about the purpose of the collaboration, let alone how such a collaboration was supposed to work, there was very little by way of response. It appears that the expectations from the public health side regarding brucellosis had been set in such a manner that the overwhelming focus was on developing awareness among physicians about the existence of brucellosis as a possible public health problem.

A report from a government deliberation on developing a brucellosis control strategy lists the following contours for animal-human health collaboration around brucellosis:

> *The successful implementation of a brucellosis surveillance, prevention and control programme requires strong intersectoral collaboration, especially between the public health and veterinary sectors, at all levels. To strengthen intersectoral collaboration for effective control of brucellosis and other zoonotic diseases, measures of particular importance include establishment of: a) Advisory committees on zoonoses; b) Veterinary public health units In ministries of health; c) Compulsory sharing of information and cross-notifications of case; d) Joint outbreak investigations; and e) Joint training activities* (Kumar and Singh, 2013, p. 8).

Given the fact that I could find only one public health researcher mentioned in the list of participants at this meeting, I propose reading this list more as a charter of expectations from the animal health side, rather than as a framework for developing comprehensive intersectoral collaborations around brucellosis prevention and control.

7.7 CONCLUSIONS

Brucellosis, a disease well-established in Indian livestock and, very likely, in human populations, has experienced a mixed fate in India, not uncommon to other zoonoses. It has gained notoriety both because of its high levels of presence in the animal population, and consequent threats to the economic potential for the livestock sector. It is also looked upon suspiciously by veterinary professionals because of the risks posed by the disease (and the interventions) to their health and social standing.

On the other hand, despite abundant, but patchy, evidence around the disease, especially in the animal health sector, it appears none of the professions has managed to develop a convincing narrative about the quantum of the burden in animals and humans alike.

A lack of a convincing, broad narrative about the importance of the disease, in turn, has resulted in it being neglected, at least until a counter-narrative of brucellosis as an economic threat was developed among the animal health profession. Within the human health sector, the lack of awareness about the prevalence of brucellosis as a health problem continues.

Of late, brucellosis' rise to prominence, marked by the launch of a national control policy, has been constructed around the politics and economics of cows and the associated dairy industry. However, as discussed earlier, the significance attached to the cow itself gave more incentives to the key actors to distort, obscure or highlight the disease in different ways.

Thus a combination of discourses that focus on disease risks among animals rather than humans, and the politics of the cow as religious symbol and the dairy industry as an important economic sector, has meant that intersectoral collaboration around brucellosis, despite the evident impacts on human health, continues to be ignored.

Differences in the training, worldview and motivations of animal and human health professionals mean that the space for collaboration remains limited, until a more convincing framing of the disease becomes prominent, and which encourages more assessments within the human health sector as well.

8 INTERSECTORAL COLLABORATIONS

Having concluded the chapters on three disease-based case studies, this is a good place to recap the major findings and arguments covered so far before bringing the discussion back together towards the underlying theme of the thesis, namely how and why intersectoral collaborations happen, or do not.

Thus far, I have made a case for the importance of studying the politics of the development and workings of animal-human health intersectoral collaborations if prevention and control of zoonoses in India is the goal. I have used the examples of three zoonotic diseases in two different states in India to identify and analyse the discourses, practices and politics of intersectoral collaborations.

Earlier in the thesis, I prefaced the disease-based chapters by describing the broader discourse around zoonoses prevention, the intersectoral collaborations called One Health internationally and within India. I discussed the long-standing history of collaborations preceding and parallel to the discussions around One Health. I then discussed the specific requirements expected from One Health intersectoral collaborations that could work within the federal governance structures in India and the sometimes-contrasting mandates of the involved sectors, while discussing specific examples of zoonoses collaborations at the national and state level in India.

The larger context thus laid out, I used the subsequent three chapters to examine disease-based intersectoral collaborations in Gujarat and Tamil Nadu. The themes I analysed, included, among others, the local disease and political contexts underlying the intersectoral collaborations, the contrasts in practice with the ideals of a One Health approach, the politics of using scientific knowledge for decision-making, the everyday practices of front-line workers, as well as the nature of Indian bureaucracy in influencing the interpretative process.

Drawing upon examples from response to brucellosis and anthrax, I argue how animal-based diseases can simultaneously provoke dismissal and alarm, based upon the perceived severity of their manifestations. Witnessing first-hand the response to an actual outbreak of anthrax, I saw for myself how sector-based power dynamics could be flipped and the veterinarians could actually be the ones in the driving seat dictating the policy agenda by virtue of their deeper engagement with zoonoses.

The chapter on leptospirosis described how the compulsion to preserve a success story narrative meant that the government restricted access to disease information in order to

regulate the direction of narrative. The cases of both leptospirosis and anthrax involved prophylactic use of antibiotics in large populations. This was simultaneously a populist as well as a defensive response by the state to potentially serious public health emergencies, even when the scientific opinion weighed against such an approach. This case illustrates the contested nature of the role of scientific expertise in decision-making as well as the tensions that govern the interactions between officers of the state and the public whom it is supposed to govern.

The chapter on brucellosis dealt with the framing of disease narratives and investigated the associations between the availability of epidemiological information and political prioritisation afforded to a disease. I was surprised to find that the presence of the former did not automatically result in the latter. In most cases, there were other factors that influenced how available scientific knowledge was translated and packaged into framings that informed popular understandings about the disease.

Anthrax and leptospirosis, despite their zoonotic transmission, represented outbreak-causing diseases that were perceived by the state agencies to be exclusively the problems of animal and human health sectors, respectively. In contrast, the disease of brucellosis had silently spread to large segments of the livestock population, as well as to the human population, but was still ignored as a public health challenge, while only attracting a half-hearted response from the animal health sector.

The response to leptospirosis echoed findings from the other two diseases in showcasing the instrumental nature of intersectoral collaborations, politics of interpreting and translating scientific evidence to inform decision-making, and an ever-present desire among government agencies to be seen by their constituent public as being in control.

Together the three case studies thus proved useful in offering a disease-based and place-based explanation of the development and functioning of intersectoral collaborations. In the current chapter, I propose to build upon the discussions so far and conduct a wider analysis, drawing together the findings from the disease case studies, comparing intersectoral collaborations across diseases and geographies in India. In the process, I will refer back to my original analytical framework and structure the discussions along three broad categories of politics, discourse and practices to assess whether these intersectoral collaborations are comparable and, if so, what are some of the overarching factors that help us understand them. This is essential if 'One Health' ideals are to be realised in practice.

8.1 POLITICS OF DECISION MAKING

Any discussion of the politics of decision-making around zoonoses cannot be completely divorced from the politics of representing ideas, as well as the discretionary nature of translating policy discussions into everyday practices. However, the discussions in this section will have a more limited scope, as the other themes are covered in subsequent sections. In this section, I focus on three strands in analysing the politics of decision-making around zoonoses in India. The first seeks to compare the local political characteristics and their influence upon zoonoses-related discussions at the state level. This will include state-level characteristics such as political culture, institutional capacities as well as the relationships of state institutions with the central government.

The second strand revolves around the nature of bureaucracy in India, including its use of technical advice as an explanation for the decision-making observed across different zoonotic diseases in the earlier chapters. Finally, the last strand in this section dissects the tensions that exist between the animal and human health sectors as well as their parent disciplines of veterinary sciences and medicine, respectively. I discuss the professional cultures informing the practices in both sectors and the power dynamics that exist between the professions. I contrast the differences in operational incentives as well as institutional capacities that exist in both the sectors and how these are used as a source for furthering the divide as well as forming bridges across both the sectors.

Comparing place-based politics in Tamil Nadu and Gujarat

In the earlier chapters, I described the performance of intersectoral collaborations developed around specific diseases at the state level. While the chapters highlighted some of the peculiarities of my study states, I aim to bring the discussion together in this section and examine the role state-based politics can play in decision-making around zoonoses. The differences in approach to zoonoses, specifically among my study states of Gujarat and Tamil Nadu, is best illustrated by the specific examples of 'One Health' collaboration recounted to me by officers in both the states, as described in chapter 3.

As described earlier, whereas veterinary officers in Gujarat organised a 'seminar' addressed by Food and Agriculture Organization (FAO) and state political leadership as a means to promoting the idea of One Health in the state, officers in Tamil Nadu chose a different, more ambitious approach. The chief bureaucrats of Health and Animal Husbandry departments co-chaired a meeting to develop plans for a formal One Health unit in the state with the aim to institutionalise regular coordination between both the departments. While both the collaborative mechanisms displayed administrative

innovations that catered to local concerns, they differed in the scope of activities and, more importantly, the time horizon envisaged for the intersectoral collaborations.

The seminar in Gujarat appeared to be addressing more immediate concerns of acquiring visibility for the Animal Husbandry department in front of the Chief Minister and gaining credibility for a One Health approach. The discussions in Tamil Nadu, on the other hand, aimed to establish an administrative framework for a longer term, and more substantive, collaboration. While it is possible to identify several possible explanations for the differences in approach towards intersectoral collaborations in Gujarat and Tamil Nadu, ranging from institutional capacities and openness to administrative innovations, most explanations identified in chapter 3 are, ultimately, a product of the political and administrative cultures prevalent in the states which, in turn, govern the prioritisation accorded to such innovations.

While justifying my choice of studying intersectoral collaborations at the state level, in chapter 2 & 3, I highlighted how health was classified as a state subject in the Indian constitution, making states the most consequential theatre of policy-making when it comes to zoonoses (Ministry of Law and Justice, 2018). However, as I demonstrate below, even if it were not for the argument about jurisdictions, it would still be important to study the characteristics of state-based politics in order to explain zoonoses policies in India.

As discussed in chapter 2, and reflected in the works of Indian scholars, place-based politics is an especially important factor in shaping public agendas in India and deserves comparative political analysis (Deshpande et al., 2017; Harriss et al., 2005; Manor, 2010). Two recent publications demonstrate the relevance of comparative analysis in the specific context of my research by comparing the political regimes and developmental outcomes in the state of Gujarat and Tamil Nadu, both arriving at similar conclusions (Joshi and McGrath, 2015; Kalaiyarasan, 2014).

> *The long-standing debate on growth and development has been renewed in recent works of Jagdish Bhagwati and Amartya Sen. This paper intervenes in this debate with evidence from Tamil Nadu. Tamil Nadu, which, unlike Kerala, did not have initial advantages over Gujarat, outperforms the latter on nearly every development indicator at the level of indicators as well as in the rate of change. This is despite Gujarat having a slightly higher economic growth rate. Tamil Nadu's relative success is the result of state intervention in providing essential public services. Further, the history of social mobilisation in the state has been crucial in ensuring the formulation and efficient execution of social welfare measures* (Kalaiyarasan, 2014, p. 55).

Similar to Kalaiyarasan (2014) quoted above, Joshi and McGrath tried to examine the links between political ideologies, administrative cultures and developmental outcomes,

specifically in the states of Gujarat and Tamil Nadu. They credit Tamil Nadu's "*more egalitarian ideology and higher quality of public administration*" as being "*crucial to Tamil Nadu's success in simultaneously improving human and economic development*". This, they found, was in contrast to the "*lopsided*" growth experienced by Gujarat (Joshi and McGrath, 2015, p. 465).

Joshi and McGrath's findings echo the conclusions of more detailed assessments of political scientists and developmental researchers conducted in both the states. While both Gujarat and Tamil Nadu are large and economically well-off states, both have experienced different social and economic trajectories that have influenced the current state of political and economic affairs, as I will demonstrate below.

Figure 41: Nurses protesting promotion policies, DMS Office, Chennai.

For example, the emphasis on universal social protection in Tamil politics, combined with its caste characteristics, led to the development of a unique brand of populism and expressive politics (Figure 41) in the state (Fuller and Narasimhan, 2015; A. Wyatt, 2013a, 2013b). This stands in contrast to the emphasis on politics of promoting big business and majoritarian politics that has characterized social development in the state of Gujarat (Berenschot, 2010; Jaffrelot, 2015).

On the other hand, weak delivery capacities of the Gujarat state means that people have to turn frequently to political mediators to gain access to their entitlements (Berenschot, 2015) or, alternatively, depend upon private philanthropic institutions for gaining access to other services (Dekkers and Rutten, 2018; Haynes, 1987). The initiatives that tended to be more popular in Gujarat were those set up on the lines of the dairy cooperatives or the

more recent *Chiranjeevi yojana* in animal and human health sectors, respectively, which operate largely outside the government systems. Whereas the cooperatives organised and self-funded initiatives that managed all levels of dairy value chain with minimal inputs from the government, C*hiranjeevi* scheme allowed poorer pregnant women to seek delivery services at a private facility subsidised by the government. The scheme proved popular among public health circles as it, apparently, allowed the government to increase institutional delivery rates without creating infrastructure for the same.

However, despite early indications of positive outcomes (Mavalankar et al., 2009), later evaluations showed that the scheme "*had no significant impact on institutional delivery rates or maternal health outcomes*" (Mohanan et al., 2014, p. 187). This was likely due to the lack of availability of gynaecologists in rural areas and selective selection of 'safe' cases by the participating physicians (Acharya and McNabee, 2009).

Thus, it transpired that even a 'hands-off' intervention like *Chiranjeevi* accomplished little due to the weak capacities of the state and ended up exacerbating the inequalities underlying the larger Gujarat society. Similar to the health scheme, media reports have demonstrated that despite its history, even the famed dairy cooperative movement has suffered major setbacks as political interests have trumped profitability or quality (Rajshekhar, 2018b, 2018c).

In chapter 6, I refer to the Gujarat government's predilection for projecting an image of being in control (see Figure 42) and propagating a 'success narrative' in relation to disease outbreaks. Apart from leptospirosis, this tendency was particularly highlighted during the Zika outbreak in Gujarat. At the time, instead of reporting the disease as per its obligations under International Health Regulations (IHR), the government buried the news as the outbreak coincided with the conduct of a major trade conclave (Biswas, 2017). The ruling regime's preference for announcing major schemes with limited follow-up on the ground has been remarked by many political commentators who have referred to it as 'event management' politics (Indian Express, 2014; The Economist, 2017).

If Gujarati politics is seen as having symbolic, neoliberal and majoritarian characteristics, the unique brand of populism practised in Tamil Nadu has been labelled by some as 'technocratic populism' due to its emphasis on both making welfare commitments as well as ensuring its delivery through effective administrative mechanisms (A. Wyatt, 2013b, 2013a).

Figure 42: Projecting authority: Health Commissioner's office, Gujarat.

Institutional capacity and centre-state relations

Having discussed political cultures, what are the other explanations for the differences in practices and cultures of administration in both the states? One predictor of the presence of intersectoral collaborations is the depth and variety of its institutional capacity in research of and response to zoonoses. This is also supported by One Health proponents who argue that it is difficult to achieve sustainable collaborations in the absence of minimal capacities among all sectors (Bogich et al., 2012; Stephen et al., 2004).

The phenomenon of institutional capacities is not completely divorced from the politics of place. The (state) government is likely to invest in technical expertise if it values effective delivery of services, while decreased role of technical advice means decision-making in the state is likely to lack technical credibility and might not be as effective.

In addition to informing the decision-making process, other advantages are likely in having in-house or readily accessible sources of expertise at the state level. By decreasing the knowledge asymmetries with that of central government, local technical expertise appears to strengthen the hand of state governments in their negotiations with central government within the framework of centre-state relations practised in India, as explained below.

As a bureaucrat who had retired at a senior position, pointed out in the quote below, while the Constitution has made state governments responsible for animal and human health areas, the central government can still influence decision-making in states by exploiting the technical and financial superiority of its institutions.

> *Centre-state relations...are constitutionally structured. In our sector, it is important because health is a state subject. And, in principle, the state (government) can do what it wants. I cannot, off-hand, think of a case where a state has gone against national policy... Because, by and large, states realise that the central government has much more resources in the manner in the matter of devised policy. (For instance) the big research institutions are all central (A10, 01-Mar-16).*

Thus, central agencies can dictate state agendas by using different means. One relatively straightforward way they can do so is by funding large programmes of activities that are tied to standardised operational guidelines. If the state government wants to access the funding, it would have to follow the norms set by the centre.

Another way for the centre to gain influence in state-level policies is by exercising its technical superiority. This could be by providing access to laboratory facilities of central agency institutions to state governments at times of need, such as in the case of an outbreak. This is what happened in the case of plague, leptospirosis and Crimean-Congo haemorrhagic fever (CCHF) outbreaks in Gujarat, where visiting teams of experts from Indian Council of Medical Research (ICMR) and National Centre for Disease Control (NCDC) ended up advising (and assuming credit on behalf of) the state governments.[62]

Countries in South Asia lag behind those in other regions in terms of institutional capacity for One Health research and response (Chatterjee et al., 2017). Therefore, if any state manages to create even small pools of local expertise, this is likely to give it an edge over other state governments. On the other hand, if a state is as heavily invested in technocracy as Tamil Nadu, it is easy to imagine the advantage it must enjoy during its negotiations with central government agencies. This point was brought home to me from an anecdote related to me by a friend whose work in the central health ministry involved developing an annual plan of activities for his division based upon the workplans sent by different states. As the deadline for submitting state plans approached every year, he remembered, his whole team used to be thinly stretched working on submissions from 28 different states. As a result, the workplans from states like Tamil Nadu, which had the capacity to develop well-justified proposals on their own, were much more likely to be accepted and their requests granted without many revisions. This allowed the central teams to prioritise their time to work with those state governments that could not develop plans on time without their help.

[62]As discussed in the chapter 6, the definitive statements on the initial outbreaks of CCHF, plague and leptospirosis were made by scientists from ICMR and NCDC, respectively, and not by Gujarati researchers (Mishra et al., 2011; Ramalingaswami, 1995; Zoonosis Division - National Institute of Communicable Diseases, 2006).

Possibly this is one reason why the bureaucracy enjoys a strong position in Tamil Nadu due to the political mandate to deliver on the entitlements promised to the electorate. Within the bureaucracy, especially in the health sector, the technical officers are unusually empowered compared to other states (Gupta et al., 2010). A recent news story highlighted the elevated profile of the Director of Public Health (highest ranked public health officer) in the state in a way that even undermined the leadership of the more senior health secretary (and possibly other health cadres as well) (Rajshekhar, 2016).

In addition to anecdotal evidence by commentators (Gupta et al., 2010), the technical superiority of public health institutional expertise in Tamil Nadu can be assessed by counting the number of institutions working on zoonoses there. An earlier analysis of published research from India attempted to do just that. As depicted in Figure 43, we found the maximum number of institutions publishing research on zoonoses to be in Tamil Nadu. Gujarat came much further down the list (Kakkar and Abbas, 2012).

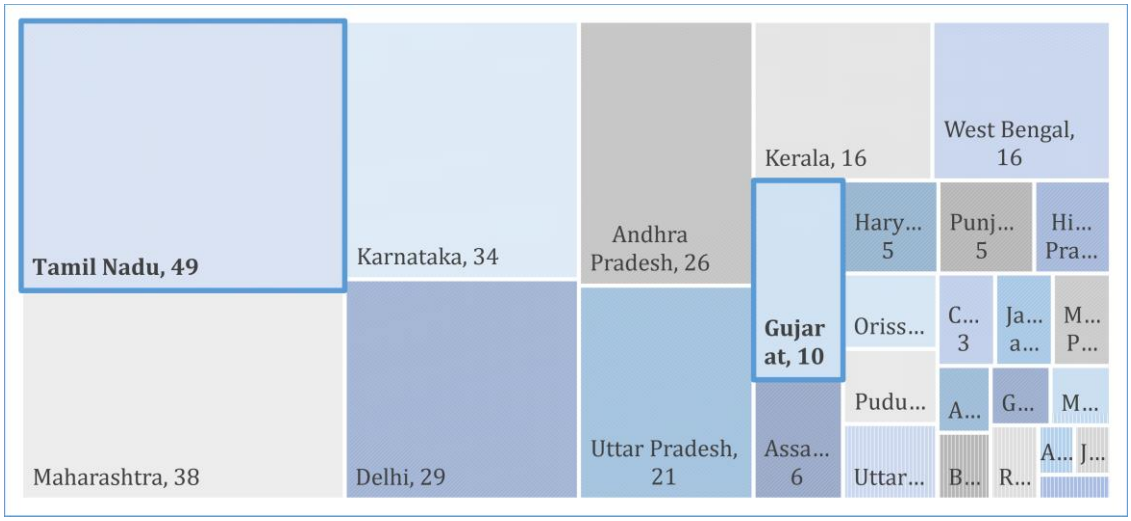

Figure 43: Distribution of zoonoses research institutions in India, by state
(Data from zoonoses research conducted on 20 priority zoonoses published from India between 2001 and 11 - n= 293). Data source: (Kakkar and Abbas, 2012)

For a variety of reasons, Tamil Nadu is equipped with a large number of national and regional institutions with expertise in public health and infectious diseases that has helped the state over time. One of the reasons why technical expertise is valued in Tamil Nadu is by consistently demonstrating value and acquiring credibility for decision-making to the political leadership. Tamil Nadu has always enjoyed an educated workforce, initially composed of upper caste Brahmins seeking a professional occupation (Fuller and Narasimhan, 2015), and also by the virtue of being the first southern capital of British India, which made Tamil Nadu the site for multiple public health interventions (Kavadi, 2007).

On the contrary, in Gujarat, apart from clinical oriented teaching institutions and a handful of newly opened research centres in public health, there is no established centre for offering public health advice to the state government. Even within the veterinary sector, apart from some newly established veterinary colleges in Gujarat, most of the expertise resides in the autonomous cooperative administered National Dairy Development Board (NDDB), where even the technical staff are designated as managers and not scientists.

In a state where the technical officers are clearly at a disadvantage within the bureaucracy (explained below), it is easy to see this as one possible explanation for the way the NCDC rode roughshod when the state was trying to manage leptospirosis outbreaks, and possibly why I detected similar underpinnings of tension with ICMR taking the credit for CCHF efforts in Gujarat (see chapter 6).

Bureaucracy

In the discussion above, I described how the availability of independent technical institutions could strengthen the hand of technocrats and improve the quality of technical advice available for decision-making, and imbue the decision-making process with a more forward-looking perspective. But in some ways, the above explanation makes certain assumptions about the nature of bureaucracy as also the tension supposedly inherent between generalist bureaucrats and specialist technocrats.

If we really want to understand the way policies are put together, it is important to subject the assumptions above to a more critical examination. In this section, therefore, I will try first to examine the characteristics, motivations and functioning of the bureaucracy. I will follow this up with an analysis of the role of technical advice and technical advisors in the decision-making process.

Similar to the UK, the political leadership in India (at the state and in the centre) is advised by career bureaucrats. Almost all the government departments are headed by senior bureaucrats belonging to the IAS, a holdover from the colonial Indian Civil Service (Potter, 1996, 1986).

Having a strong cadre of generalist civil servants was deemed to be essential for protecting the central character of the Indian republic in the initial decades following independence. However, even after 70 years, the bureaucracy has not been able to let go of these powers and, indeed, in some ways, appears to have consolidated them even further. The IAS has managed to preserve its seniority in most departments, prevented later recruitment into bureaucracy and, as exemplified by the health department in Gujarat,

even subsumed roles of other cadres into its fold (Radin, 2007; Vaishnav and Khosla, 2016).

The senior IAS officer, referred to as the Secretary of a department, in turn, manages several additional levels of bureaucracy, comprising of more junior IAS officers as well as a cadre of technical specialists who oversee actual implementation on ground by frontline staff. The chief role of these multiple levels of bureaucracy is to ensure that the priorities of the political leadership, concerns of influential interest groups as well as the mandate of the department itself are all reconciled in everyday functioning of the government.

Figure 44: Projecting order & control: Department of Animal Husbandry, Gujarat.

Managing competing priorities in an 'argumentative' democracy like India (Sen, 2006) with weak delivery capacities requires a well-thought out strategy developed over decades of cumulative experience. The chosen strategy of all senior bureaucrats I have met seems to be to project an air of authority and an appearance of being in control (Figure 44). In my admittedly limited interactions with a handful of IAS officers, I have found that unlike many other government officers I have met, they appear to speak in very low, measured tones that forces the audience to be quiet and equally affords authority to the speaker as someone who does not need to shout to get heard

A former colleague once described to me how IAS officers tend to work. According to him, they tend to 'dominate' in all meetings by asking technical questions to administrative

personnel and holding technical officers to account for administrative deliverables. Like many myths, this recollection reveals as much about IAS officers themselves as it does about the people they work with—in this case, a retired public health officer who must have endured numerous such exchanges with senior bureaucrats during his stint in the health ministry.

It is also important to add a disclaimer that not all IAS officers would try to 'dominate' all their meetings all of the time. Nonetheless, the idea that one can get their point of view carried out by virtue of 'dominating' a discussion and, by extension, ignoring alternative perspectives offers a peek into how government officers might view themselves, their organisation, and the way things get done.

This is also in keeping with my observation elsewhere in the thesis chapter 6 about the popular understanding among civil servants that good leaders are those who know how to 'extract work' from the system.[63] What implication does such a style of working and organising individuals have on how decision-making occurs around zoonoses and intersectoral collaborations?

In such a conceptualisation of bureaucracy, where even the senior leadership feels that they are allowed to and, indeed, have to, 'extract work' coercively from reluctant professionals, it is easy to see that those lower down in the hierarchy might feel a loss of agency and limited sense of ownership of their work.

This also means that in those institutions where the distinction between technical and generalist bureaucrats is clearly demarcated and placed in a rigid hierarchy, the level of engagement and quality of technical advice for decision-making is likely to suffer.

Something similar was observed in the case of leptospirosis in Gujarat (chapter 6) where the post of chief public health officer in the state (referred to as Commissioner of Health) had been taken over by the generalist, but privileged IAS cadre officers. Unlike specialists from the public health cadre who are invested in a department for most of their careers, the more senior but generalist IAS officers often have a relatively short tenure of approximately three years or so within each department. In addition, because of their position within the bureaucratic hierarchy, the IAS officers are responsible for advising the ministers – the political leadership. Both the ministers and their IAS advisors have to

[63] A possible explanation of the working culture within the bureaucracy is discussed in section 8.3 on Practices

demonstrate credible outcomes within a 3-5 year period before the next elections or transfers, respectively.

The longer term vision and investments required for credible policy impact will not carry much weight in such an institution, especially if the system is organised in a way that the perspectives of the leadership 'dominate' over those of the 'subordinates'.

This is probably why Gujarat finds it easier to establish episodic collaborations focussed on individual diseases rather than adopting a longer term, and more formal collaborative platform being discussed in Tamil Nadu that would likely take a couple of years and multiple levels of negotiations to mature.

On a related note, and as captured by Jasanoff (2011), it is also worth examining whether the distinction between the specialist and generalist functions in a bureaucracy are really as demarcated on the ground as they appears in the discussion above. In the course of my fieldwork, I met with bureaucrats who tried to convey their understanding of the technical nuances, and also with subject-specialists who appeared more comfortable in their roles as officious bureaucrats.

Programme managers working within the formal bureaucracy of the health or animal husbandry department are tasked with implementing the government agenda. Therefore, it did not surprise me to find them adopting the methods, speech and biases of the government bureaucracy they were so much a part of. [64]

However, what proved to be a bigger surprise to me was to find academics, who were working in notionally autonomous public universities, adopting the persona of government officers. For instance, decking up their official vehicles in the manner of government-issued Ambassador cars (see Figure 45). The adoption of a government officer persona by academia was also expressed, memorably for me, by the refusal to discuss leptospirosis in Surat by senior professors in Government Medical College, Surat citing government restrictions, even when the government officers themselves were keen to do so.

To summarise, while it is useful to visualise state officers as having a technical or specialist function, it is important not to treat this as an exclusive categorisation and realise that

[64]For instance, following a formal, paper-based culture that insisted upon 'official' applications and a rigid interpretation of 'guidelines' before allowing me access to government officers or documents, both in Tamil Nadu as well as Gujarat.

administrators tasked with implementing a political vision will not hesitate to make use of technical experts, nor will the technocrats cease to make use of generalist expertise.

Figure 45: Professor or public servant? (Picture at Madras Veterinary College)

Vets and Medics: Professional cultures and tensions

Any discussion involving collaboration among animal and human health sectors will be incomplete without an examination of the dynamics between the two sectors themselves. Literature on intersectoral collaborations repeatedly highlights the importance of pre-existing networks and relationships between partnering organisations as a condition for intersectoral collaborations to develop (Ansell and Gash, 2007; Bryson et al., 2006).

While historically, the parent disciplines of both the sectors were closely aligned (Woods and Bresalier, 2014), on the policy front, there are considerable impediments to the coming together of both the sectors. Some of these are described by a senior public health manager in Tamil Nadu as follows:

> *It's the revenue generating department—agriculture—so they make sure that their focus is food production, food safety and economic productivity. So, if the animal is very sick…it will cost a couple of hundred rupees or thousand rupees. But they just sacrifice the animal because there is cost to each and every animal as it's not (in) human health.*
>
> *Different departments have different incentives. (For) human health, you want to give in money and you make sure that human health is not lost. Animal health… can't spend too much money… because they can't generate income and animals' lives are not worth that much.*
>
> *And second issue is that people who are vets are those who wanted to become doctors. A lot of them, not all of them, could not get through (the competitive medical school entrance tests) for whatever reason. So, it is the power dynamic… (even though the) animal doctor may be dealing in multiple species and have much better understanding about zoonosis (B10/ 04-Jul-15).*

The above quote contains several salient points with respect to practical challenges facing animal-human health sector collaborations. The first, and foremost, among them is the mismatched, sometimes conflicting, mandate of both the departments and the resultant difference in expectations from the officers participating in collaborative discussions. This runs counter to the overarching narrative around animal-human health collaborations that is promoted by the One Health movement focussed almost exclusively on health protection as its *raison d'être*. Without getting into the related critique of 'whose health' they are talking about, almost all One Health discussions seem to have the following as an underlying assumption —"protection from diseases will lead to better health, which is a public good. Therefore, everyone needs to come together in order to work more efficiently/effectively".

This might sound like a reasonable ideal to work towards. However, at the level of the livestock programme managers whose performance is measured in terms of food production (and safety), they cannot justify going into expensive intersectoral collaborations unless they are directly and visibly affected by zoonotic concerns.

The quote also alludes to a subtle dynamic at play between the veterinary and medical professions that anyone who has done secondary schooling in India would be aware of. In a country with high educational aspirations and limited employment opportunities in the formal sector, there is a lot of competition to get into training programmes for the supposedly 'safer' professions of medicine and engineering. As a result, medical and engineering entrance examinations have become absurdly competitive in India with a single mark deciding the fate of thousands of students. Those who are not able to secure admission to a public-funded medical school and are not able to afford the fees of a private medical school either try their luck next year or, alternatively, get into one of the other

professional courses open to secondary school graduates from biology stream, such as veterinary medicine, agriculture sciences or paramedical course.

In a society that promotes hierarchies based upon caste, class, religion, gender and geography, disciplinary segregation of 'animal doctors' from the more successful 'human doctors' is a given. The disdain for veterinary professionals and their profession gets reflected in subtle, and sometimes, not so subtle ways, as described by a veterinary epidemiologist below:

> *So we had seen that always health department, whenever there is a zoonotic (disease event)...health department does lot of blaming. (They say), "It is because of your animals it has happened". So a war starts from these words. And then after sitting and discussing with them...we let them into the knowledge that we people are doing so many things... (E6/10-Feb-15)*

Based upon my conversations with veterinarians, most would have experienced interactions like the one described above. It is natural that many would be hesitant about investing a lot of personal capital in nurturing intersectoral collaborations with the human health sector if they feel their contributions will not be valued.

The preceding discussion outlines some of the differences in perspectives, mandates, power and capacities that exist between the animal and human health sectors and their professionals. While these appear to be major impediments towards developing intersectoral collaborations, nonetheless, as I will attempt to show below, many of the same points of difference can actually help nurture interdependencies and a complementarity of strengths between the sectors, which, in a different set of circumstances, might actually end up promoting collaboration.

While the veterinarians and physicians have different academic training and focus, there are still several commonalities and, indeed, many areas where the veterinarians enjoy greater field exposure than most physicians. For starters, the veterinarians are trained to diagnose and treat diseases in multiple species, a skill set clearly lacking in human physicians (Frank, 2008). Second, the veterinarians have dedicated modules on laboratory as well as clinical aspects of zoonoses. This is in contrast to the human physicians who are largely unaware about zoonoses as a disease category (Kakkar et al., 2011b).

In fact, as alluded to in the above quote, it is not unusual to find that once the barriers to collaboration are lowered (mostly in the face of an outbreak), and both the sectors have an opportunity to work towards a common goal, public health counterparts are able to develop an appreciation of the unique expertise of the veterinarians.

In addition to the above quote, which relates to the contributions of the veterinarians to controlling CCHF outbreaks in Gujarat, I came across multiple instances in my fieldwork where the veterinarians got a chance to prove their capabilities and managed to even flip the power dynamics inherent in most animal-human health interactions. For instance, as discussed in the chapter on anthrax, the veterinary officer was the only member of the outbreak response team who had a first-hand experience of controlling the disease and ended up directing the response measures of senior public health officers. Also in Tamil Nadu, an officer with the Director of Public Health recalled how he started appreciating the expertise of the veterinarians while working closely with them over a period of two weeks in a remote district trying to identify and control a suspected outbreak of avian influenza. According to him, this was one of the experiences that fed into the development of a proposal for establishing a formal One Health intersectoral collaboration in the state (Field notes, 18 July 2015).

Even the supposed mismatched incentives of both the sectors could be used as an advantage, a veterinary programme manager pointed out to me in an earlier interaction. He suggested that while drawing up proposals for disease control programmes, he could only cite production statistics as that was what was available with him. He argued, he could make a stronger case if he could add data around human health impact of the diseases as well. Similarly, by using economic productivity data in addition to human health risks, it might be possible for public health program managers to make a more effective funding case for their disease control programmes as well.

The difference in objectives of both the departments which leads them to assess their performance using different sets of metrics, if combined, could make a stronger case for interventions by both the sectors.

8.2 DISCOURSE

Having discussed the role of place-based political and administrative cultures and power dynamics in influencing decision-making around zoonoses, this section analyses the related theme of discourse. As I explained in chapter 4, I use the term discourse, both in the Foucauldian sense of analysing the power exercised in the generation and interpretation of knowledge, as well as in a somewhat narrower sense of plotting the narratives and storylines around the way zoonoses and collaborative policy action were framed and given meaning to.

In this section, I reflect on three ways through which plurality of framings and contested meanings help influence the debates and set the agenda related to zoonoses policies and

collaborations in India. These include disconnect between global rhetoric and local perceptions; framing of disease narratives; and finally, the use of expertise in decision-making.

Global rhetoric vs local realities

As discussed in the introductory set of chapters, of late the One Health approach has been subject to multiple critiques and commentators have sought to refine the initial vision behind One Health with increasing sophistication. These include historical contextualisation for viewing animal-human health partnerships (Woods et al., 2018; Woods and Bresalier, 2014); examination of social drivers of disease emergence (Bardosh, 2016; Craddock and Hinchliffe, 2015); as well as the challenges to governing One health at global (Lee and Brumme, 2012) and national levels (Okello et al., 2014).

However, despite a proliferation of these critical voices, the dominant narrative seems to rest on a similar outbreak-focussed premise as the earlier framings of One Health; such as the Manhattan Principles, which outlines the rationale for what turned out to be One Health approach as "*preventing epidemic / epizootic disease and for maintaining ecosystem integrity*" (Cook et al., 2004).

Following an initial period of confusion about the global stewardship of the One Health movement (Lee and Brumme, 2012), it appears that the agenda for its implementation is now being led by multilateral agencies, such as the WHO/FAO/OIE tripartite, along with the World Bank. This, too, is not without its problems. A perusal of recent publications on 'Operational Frameworks' from these agencies, such as those by WHO-OIE-World Bank (2014) or the one by the World Bank and Ecohealth Alliance (2018) shows that they conceptualise multisector collaborations as formal and institutional bureaucratic mechanisms instead of the messy, political, reactive and informal characteristics that many of the collaborations I discuss in this thesis display.

International agencies, like large bureaucracies elsewhere, have always attempted to fashion the world in their own image, which meant a bureaucratised and depoliticised reading of development. This is not a new criticism and has been cited for the work of the WHO (Bruen and Brugha, 2014) and the World Bank (Harriss, 2001). Ferguson (1994, p. 176), while introducing his description of the 'Anti-Politics Machine', critiques development projects in Lesotho in a language that might equally apply to the field of One Health 25 years later:

> *"Development" projects in Lesotho have consistently failed to achieve their stated objects, not least because they are based on a "construction" of the country that bears little relation to prevailing realities. They do, however,*

> *succeed in expanding the field of bureaucratic state power in people's everyday lives…*

Here is another example of the disconnect that exists between the global rhetoric around zoonotic diseases espoused by international agencies and global civil society and the felt needs of affected countries. While the dominant zoonoses narratives focussed on exotic and emerging infections, disease priority setting exercises in multiple African and Asian settings have shown that managing existing diseases is a bigger priority than exclusively focussing upon risks for emerging diseases (Salyer et al., 2017; Sekar et al., 2011; Venkatesh et al., 2016).

As in the case of Lesotho above, the field of implementation for One Health envisaged by international agencies also appears to be a depoliticised construction having little bearing with the realities of requirements, constraints and local politics facing stakeholders at the country level. This remains a major limitation of the One Health movement. As the next section will demonstrate, selective framings of complex problems will have an impact on how the solutions are framed.

Framings and agenda setting

In the chapters on anthrax and leptospirosis, I demonstrate how their framings as animal and human health diseases, respectively, influenced the development of their disease control strategies. I also discuss how the conventional categorisation of these diseases as being either epidemic-prone, or an endemic and neglected zoonoses doesn't correspond the realities of their presentation in the field and the public's perception perceptions of them.

This is because framing of most disease narratives, by its very nature, presents an incomplete and simplistic view (Gordon, 2015) of the complex social constructs represented by diseases (Conrad and Barker, 2010).

Most zoonotic diseases combine elements of the exotic as well as the endemic. Diseases like anthrax are generally forgotten about till they erupt as outbreaks and prompt an urgent response. Moreover, as demonstrated in the case of Ebola and Lassa fevers by Leach and Hewlett (2010), the disease narratives are selective and imperfect readings, often shaped by institutional and political pressures.

Despite their reductive nature, however, narratives convey the arguments and scenarios underlying a policy option and help policymakers in taking decisions in conditions of high uncertainty where the precise nature of truth is not known (Roe, 1994, p. 3, 1989). Such narratives can help focus public attention on specific issues, for example the discussions

regarding disease emergence and global health security following the SARS and avian influenza outbreaks (Elbe, 2011; Scoones and Forster, 2008) and, which resulted in a threat-based, outbreak-focussed approach to zoonotic diseases, at least in the early days of the One Health movement (Leach, 2008).

However, while they may help focus attention on highlighted aspects of a problem, a downside to promoting the selectively framed narratives is that they can also deflect attention from other competing narratives. For example, framing diseases as health security issues didn't just lead to their politicization and international competition (Elbe, 2010), but it also resulted in shifting focus away from other compelling One Health narratives, such as those framing zoonoses not as emerging diseases, but diseases the poor were living with and getting affected by.

There are other parallels as well. As discussed in chapter 5, a systematic underestimation of anthrax eventually resulted in reduction of vaccine production and reduced preparedness levels in the states of Karnataka and Andhra Pradesh. Similarly, a selective framing of leptospirosis as a human health issue or that of brucellosis as an animal health one, meant there was little interest to conduct joint assessments of the distribution and transmission of these diseases from both the sectors.

What happens to the diseases that get neglected? Recalling the discussions from the chapter on brucellosis, lack of attention to a disease from the public discourse is likely to lead to a self-perpetuating cycle of neglect, wherein lower attention from researchers lead to lower rates diagnoses, poorer and lesser information, further neglect from the media and the public, leading to lesser funding and other incentives for research in the area. It can be argued that a counterpoint to this cycle of neglect also exists – a self-perpetuating cycle of visibility. Once a disease framing finds public attention, it is easier to mobilise more attention, discussion and funds for continuing to discuss different aspects to it.

However, there are three sets of assumptions that underpin this visualisation. The first, already established in the case of brucellosis in this thesis, and by other scholars for other diseases, facts like burden or risks for the diseases do not matter (greatly) in agenda setting. Shiffman and Smith (2007) have identified multiple factors that can influence agenda setting in global health where the interests of the actors involved and their political motivations seem to matter as much as the framing of the policy ideas themselves. Secondly, individual diseases can have multiple framings – as in the case of anthrax framing as a potential bioweapon and a disease of poverty. It is quite possible that one framing might enjoy more attention than the other. Finally, like all narratives, there

are always competing framings for diseases. As such the dominant framings, when challenged, can break the cycles of neglect, or of visibility.

This was observed, most notably, in the case of brucellosis itself. While most policy change is supposed to be incremental in nature, major shifts in policy stance take place in suddenly placed, infrequent intervals (Baumgartner and Jones, 2010). However finding explanations and locating agents for policy processes is always a challenge (Shore et al., 2011, pp. 9–11). From the brucellosis chapter it appears that most stakeholders were either not aware about the disease, or preferred that it not be discussed lest their interests get hurt. The agronomists and dairy scientists' views regarding the barriers to sustainability of the artificial insemination programme (due to high prevalence of brucellosis) appears to have achieved a policy shift in a way that the epidemiologists' disease numbers hadn't. In the language of Kingdon (2010), it appears that when a policy window was created by the seeming difficulty of continuing cattle insemination programme, policy entrepreneurs like NDDB and ICAR scientists were able to frame a new policy image by presenting the problem of brucellosis as an economic one which resulted in the launch of a national brucellosis control programme.

This brings us to a related question – what kind of framings ensure higher visibility for associated diseases and what could be the explanation. As discussed earlier in this chapter, policy-making is a messy, non-linear process and policy discourses do not always proceed in a predicted direction. However, based upon the experience from my study, it seems to me that framing a disease as being visibly life-threatening, and having the potential to impact key opinion-makers – 'people like us' will generate greater traction than framings around associations with poorer and marginalised groups, or framed as causing silent morbidity. Within my limited sample of three diseases, it appears that leptospirosis elicited the strongest response from the public, in terms of demands for services, as well as the government. Response to the outbreak of anthrax was also very prompt, but of questionable efficacy; though given the short duration of the outbreak, it is difficult to predict how the response would have unfolded over a longer period.

The response to leptospirosis got much more urgent and stronger once the disease entered Surat district, and then the city itself. Brucellosis, on the other hand, kept being ignored by human physicians as well as animal health program managers till its impact on the dairy sector, and hence wider ramifications on the society became clearer. Urban populations in Surat, milk consumers in the organized sector, are more similar to the working urban middle-class population from which the journalists and government servants come from, than do poor farmers and shepherds living at the margins of urban

imagination. And maybe this is the reason why their plights (and diseases) receive less attention than others.

Politics of scientific advice

Unlike the relatively simple explanation of use of scientific advice to craft a new policy narrative, cited above for brucellosis, scholars of science and technology studies have problematised the process of giving scientific advice. They argue that sharing of political advice is seldom a linear (or scientific) process (Boswell and Smith, 2017). There are different types of expertise, each serving their role (Collins and Evans, 2007), often under the compulsion to provide actionable recommendations even when operating under uncertainties (Stirling, 2010). All of this goes on to show that politics plays an integral part in shaping and use of expertise to 'inform' policy debates, even if the experts themselves are not always aware about it.

As seen in the case of brucellosis above, and also shown by Stirling & Gee (2002), differences in disciplinary perspectives and understandings can lead to experts from different backgrounds framing a problem in different ways> therefore, it is likely that the precise nature of the outcome of policy discussions will depend upon who has been invited to the room. Taking the example of the anthrax outbreak in Vellore chapter 5, the presence of a veterinary officer in the response team, who was the most experienced and aware about anthrax outbreaks, had a definite influence on the ultimate decisions of chemoprophylaxis.

To be sure, there were other references suggesting chemoprophylaxis such as the CDC guidelines for inhalational anthrax, as well as the manual on anthrax control published by the NCDC, which also have contributed to the final decision choice. However, it is quite likely that the confidence and assurance of the veterinary officer on the topic of anthrax and the use of chemoprophylaxis was the decisive factor in the decision to distribute antibiotics to the village residents at risk of catching the disease.

Jasanoff (1992) has commented upon the blurring of identities that might occur when experts themselves become a part of the decision-making process. Also, the fact that the public health and veterinary officers in the anthrax response team were direct employees of the state government ensured that their recommendations were more influenced with ensuring the government's objective of preventing the political fallouts of the outbreak than with minimizing the risks of adverse effects and antibiotic resistance in the community.

The way expert bias shapes a policy response, can also be seen, to opposite ends, in the aftermath of the leptospirosis outbreak recounted in chapter 6. The key decision-makers appeared to have little interest in discussing the animal part of the disease transmission cycle, even in 2016 with me, when much more was known about the limitations of current strategy. It is quite likely that lack of awareness, coupled with the overwhelmingly medical nature of the expert group as well as the politically sensitive environment would have resulted in the animal components to disease control efforts being dropped over the years.

Scientists might have different motivations for conducting boundary-work at policy venues ranging from demonstrating 'impact' of their work or for validation of their approaches in a more practical setting. But it can be argued that policymakers might, in some cases, derive more benefits from engagements with scientists than the scientists themselves – both from the value of their advice in informing the decision-making process, as well as from the derived authority of their work. Boswell (2008, p. 472) argues that expert knowledge, in addition to serving an instrumental function of offering strategic advice, serves a largely symbolic role – through *legitimising* the credibility of the advised institutions and by *substantiating* its authority to work in the area.

The medical experts advising the government of Gujarat on leptospirosis control appear to have played the roles theorised by Boswell above. Senior medical researchers were used by the public health department to assist them in assessing the situation, developing appropriate response and as well as clinically managing the affected individuals themselves.

While this assistance must have been extremely useful in a relatively-resource constrained setting, over successive years of engagement, it is likely that an even more important role emerged for the medical faculty – to legitimise the government's response strategy, and subsequently, to reinforce the success story narrative crafted by the government. Even if it was possible to critique the leptospirosis strategy for being overtly reliant on a clinical approach, as Prasad (2000) does in the early years of the outbreak, it would be difficult to doubt the intentions of the response team when all the top doctors in the district were advising the government.

Political scientists have also discussed the tragedies that can occur when those giving advice are themselves unaware of the political forces underpinning their work (Jaeger, 2007). Once their purpose was fulfilled and the disease numbers looked like coming down, the surveillance database was taken over from the medical college and restrictions put in place for publishing analysis outside a restricted academic setting. Successful policy

advisors know how to navigate the politics and influence policymaking process (Sohn, 2018), and it is clear that while engaging with policymakers, the scientists should know what they are getting into.

Figure 46: Discarded files, Chennai: Policy messes

8.3 PRACTICES

The earlier sections in this chapter have discussed the role of politics and discourse in influencing policy outcomes and help us understand the larger dynamics at play. However, if we want to gain an understanding of how these dynamics help shape policy outcomes on the ground, then we have to study the actions of different actors and their negotiations take place in the field (Ortner, 1984).

In this section, I argue that the everyday practices of the middle level bureaucracy – the focus of my research – is marked by informality and discretionary practice. I explain their rationale for adopting these practices, citing the nature of their work involving bounded rationality, decision-making under ambiguity and a dual nature of their relationship with the publics.

The argument is that, in practice, on the ground, particularly in remote district offices, people have to improvise, and innovate. They must adapt to often fast-changing circumstances. Their aim is to deal with the disease, but often their official, professional knowledge is not enough. They have to use tacit, experiential, local knowledges, and interact with others (including villagers) in ways that allow One Health to emerge in practice, but not by design.

Everyday practices

The focus of my research, as explained in chapter 3 on Methods, was on the middle level government officer, who lay claim to technical expertise and work in a specialist role for the government — in my case to do with preparedness and response to infectious disease outbreaks. The conventional image of lab coat wearing scientists does not apply to most of my respondents. Instead of working on solving exclusively scientific problems, the role of these scientist bureaucrats is to reconcile the political objectives of their leadership with the interests of the affected community, all the while operating within the bounds of predefined administrative and scientific norms.

This section examines the motivation and understandings of those involved with translating the policy mandates into tangible actions. It does so by interrogating the everyday practices of these actors viewing them as policy translators (Lipsky, 2010) and as mess managers (Roe, 2016b) (Figure 46).

As argued by Gupta (2013, 2012), even within strong bureaucracies having rigid rules to govern the professional conduct and decision-making of their officers, individual officers end up exercising a lot of discretion in selective interpretation of these norms. This exercise of individual agency is not because of ambiguity or absence of rules; rather, it is precisely because of a surfeit of such rules. The bureaucracy in South Asia was established in colonial times and saw itself as belonging to a distinct class from the public which had to be controlled and ruled. This conceit of ruling over the affairs of the natives also carried over to the relationships with members of the lower bureaucracy, who came from the local populace and therefore, whose professional lives needed to be controlled by similar 'technologies of rule' as the normal public (Corbridge et al., 2005; Potter, 1996).

Figure 47: Managing policy messes from the control rooms.

As a result, when following all the rules becomes impossible, in the interests of expediency and to 'get any work done', some of these rules are overlooked as long as the larger objective of the activity (as interpreted by the innovating officer) can be preserved. These

kinds of reinterpretations and innovations with policy norms are not conducted at the rarefied levels of the policy elites who have to maintain their faces of controlled calmness. Rather, it is the managers of the policy messes who in their everyday practices are in closer contact with different stakeholders in the policy processes (Figure 47).

This is illustrated from the example of the district public health officer in Vellore, who rang up the district veterinary officer to exchange notes on the anthrax outbreaks response efforts between themselves, rather than arranging for formal letters through their respective superiors, as the protocol would dictate. Such collaborations are likely to be reactive, instead of proactive, disease-based, limited in scope and informal in nature. This is very much opposite of the top-down clean institutional collaborations envisaged by international agencies (WHO SEARO et al., 2008).

The role of these technical managers of the 'middle' order is also unique in the way they straddle both technical and administrative as they can create a wider operating zone for themselves than might be mandated by official norms or scientific guidelines, respectively. Mangers like these can consult (and interpret) CDC guidelines on a smartphone in a village, as well as call upon experts from the local medical college to advise, and use both as sources of legitimacy to argue for a particular plan of action with their political superiors – all in the interest of getting the work done even when the task is not clear.

This is why, I argue, it might be easier for a public health officer to propose chemoprophylaxis as a way to allay public anxieties about risks from a disease outbreak, than for more senior political or bureaucratic leadership to have done on their own.

> *When such critical cases appear, you can't say that this is not recommended, this is not done. See… then it is public health challenge and that too a crisis—there needs to be visibility of program.... People should feel that something is happening and there should be some effectiveness of it and science of intervention (D16/9 Feb-16).*

In many ways, the role of the middle level technical programme managers is best described as high reliability professionals and mess managers in the sense used by Roe (2013). Examples of such professionals include control room manager of power companies, or indeed, state surveillance officers in Tamil Nadu and Gujarat. They work in a continuous fire-fighting mode, lurching from near crisis to another near crisis. While a utility manager is anticipating where the next surge in demand will come from and how to meet it, the State Surveillance Officer supervising several disease outbreaks all over the state every week, and putting in place a response plan in anticipation of how it might unfold.

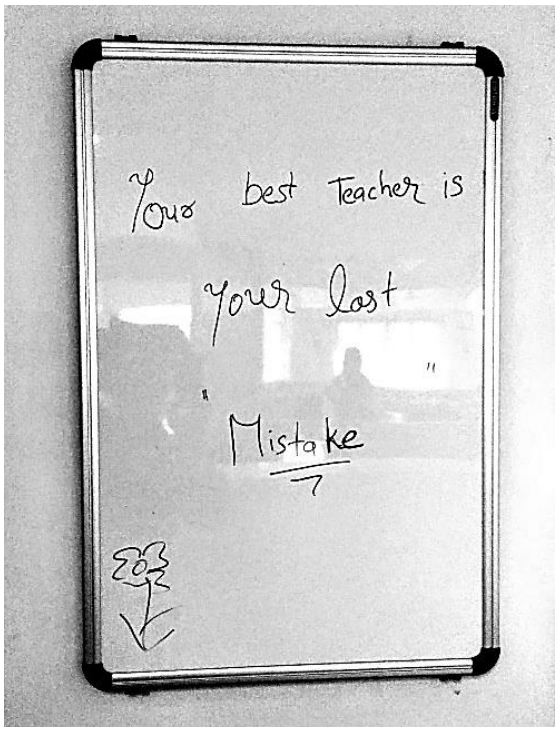

Figure 48: Sign spotted in a health department office in Gujarat.

Unlike managers of quantifiable, and predictable risks, managers like these have to operate under greater conditions of ambiguity (Leach et al., 2010b, p. 53). Their aim, therefore, is not to achieve control of the situation, but to simply manage the mess using a mix of pattern analysis and deploying second best compromises while learning from the experience (Roe, 2016a), not unlike the message I found hanging near the office of state surveillance officer in Gujarat (Figure 48).

Echoing the literature on resilience and adaptive governance (Dietz et al., 2003), literature on policy mess (Roe, 2016b; Roe and Shirky, 2014) argues that instead of wishing away uncertainties and pretending that the dynamics of the world are predictable, it is better the systems become attuned to managing uncertainties, rather than trying to avoid them altogether. Responding to a complex dynamic situation would require an element of adaptability, willingness to experiment and even tolerate some degree of failure if we are to learn from our actions—not unlike the advice on the sign hung in a corner of an obscure government building in Gandhinagar, Gujarat.

Publics: Whose risk counts?

Straddling as they are, the interface of science and government, these middle level managers can extract more room for iterative decision making than either pure scientists or administrators would have been able to do on their own.

However, while celebrating/commenting upon the degree of autonomy and freedom to experimentation negotiated by these managers, it is important to bear in mind that the subject of most of their experimentation is the 'other' members of the public (Figure 49).

Figure 49: Publics & uncertainty: Visitors passing a temple at entrance to the Secretariat, Chennai.

In the course of the three disease case studies, I have discussed the different ways in which state officers interacted with affected citizens. These interactions have ranged from contestation and discouragement to being highly responsive to the public as a group.

In the case of anthrax outbreak, the district veterinarians recounted to me how they discounted the number of sick animals reported as dead by the villages as they saw in this a ploy to extract more compensation from the government for the animal losses. Within the same village, however, the public health officers were clearly worried about the possibility of a political crisis. And, therefore, as way of assuaging the concerns of the affected village residents, they opted to distribute antibiotics in the village.

This points to an interesting – dichotomous view of the publics by government officers. Anthropologists like Marsland (2014) have reported on the dehumanising and amorphous understanding of the publics as perceived by health officers in Tanzania. Much of this certainly holds true in the Indian context as well, where the divide between citizen and state, though problematised, still exists to a degree (Partha Chatterjee, 2006; Fuller and Bénéï, 2001). Moreover, even public health practitioners cannot escape this tendency of applying a homogenising and reductive label to the publics (Krieger, 2012).

However, in addition to the above example from anthrax, there is another quote from a public health officer explaining the reason for expanding the deployment of

chemoprophylaxis all over the district, citing the difficulties in convincing local political leadership of the public health rationale for limiting the distribution of antibiotics (see chapter 6).

In both these descriptions, it appears that while the government officers certainly retain elements of disdain for the 'publics' expressed by Marsland's respondents in Tanzania, there is an added layer of understanding of the publics – that of a level of fear or even respect. Whether it be Vellore officers' distribution of antibiotics fearing anthrax being made a political issue, or the Surat officers' distribution of antibiotics because of the implacable nature of political demands – in both these cases the officers feared potential for repercussions if the public were to get local politicians to exert pressure or make a political controversy. This would likely mean additional public scrutiny of other activities of the department as well as additional pressures from departmental superiors.

Political scientists and anthropologists have commented on the blurring of boundaries between the citizen and the state in the context of the everyday state in India (Berenschot, 2010; Fuller and Bénéï, 2001; Gupta, 1995) and others have commented on the increasingly fluid nature of the term (Warner, 2002). This understanding, needs to be applied to the notion of 'publics' of public health as well.

Another way in which the 'othering' of the publics was replaced by a more sensitive understanding is best conveyed by a quotation from a public health researcher in chapter 6. The researchers shared how, following community-based surveys, the research team's understanding of the amorphous public affected by leptospirosis outbreaks changed into something much more personal and nuanced, and the way this affected the leptospirosis control strategy.

The earlier understanding was that anyone, especially those exposed to stagnant water in the affected villages, might be at risk of developing the diseases, such as paddy cultivators. However, upon gaining first had experience and conducting large surveys, they realised that in many villages in the marshlands, it did not matter what their occupation was—even if one were a teacher, one had to cross the same fields and was possibly as exposed as the poor worker in the paddy fields.

8.4 ANALYSING COLLABORATIONS

Throughout this thesis I have attempted to unpack instances of animal–human health intersectoral collaborations centred on individual diseases. As brought together in this

chapter, I have analysed the role played by larger, structural as well as more locally relevant contextual factors in each of these collaborations.

In this section, I aim to bring the discussion together in order to formulate a more direct response to my research question – *Under what conditions do intersectoral collaborations for prevention and control of zoonoses in India occur (or don't)?*

Politics

Based upon a review of examples covered in this thesis, it is possible to say with confidence that collaboration does not come in a single form, but tends to vary depending upon the local needs and political and administrative conditions facilitating these. In the beginning of this chapter, I cite place-based political analysis to highlight the role of political cultures of the ruling regimes as a major factor in influencing the shape of collaborations emerging in both my study states.

The emphasis on technocratic populism, combined with the social acceptance of a paternalistic politics in Tamil Nadu could explain the high degree of institutional and workforce capacity within the state and a reliance on the administrative machinery to be able to deliver on the government's commitments. This is the reason why the anthrax outbreak response team in Vellore did not need to import expertise from outside and every member, including the 'experts', were all government staff. This would also explain how the state government, building upon its experiences of a formal rabies coordination committee, and work in avian influenza, proposed a formal collaboration mechanism in the form of a state One Health unit.

Gujarat, on the other hand, scarred from the public shaming it received during the 1994 plague outbreak, and having a culture of limited government presence in public health, chose to respond differently. The discussions on collaborations there appeared to be more *ad hoc*, reactive, informal and disease-centric in nature – a characteristic that runs contrary to the ideals of the One Health movement. Yet, it seemed to have done a reasonable job of managing CCHF and leptospirosis, albeit with some limitations. In the case of leptospirosis, the government was quick to leverage expertise of academicians from outside the department and mount a major public health response. The anxiety not to repeat the failures of 1994 manifested in multiple ways, including the provision of advanced medical care in remote hospitals as well as crafting a success story narrative by demonstrating the disease was brought under control. Of course, the narrative had several shortcomings, including reliance on flawed epidemiology and lack of critical analysis, but these never came in the way of politics.

The third case study on brucellosis, demonstrated how too much politics could also become detrimental to advancing policy debates. Cattle is one of the species affected by brucellosis and they occupy a very important position both in the political as well as economic consciousness of India. This level of visibility did not actually serve the cause of disease control, and might have delayed action on brucellosis because of powerful political and economic actors that did not want to suffer adverse impacts through a public discussion on the disease.

Politics of knowledge: Framing and expertise

When introducing my analytic framework, I discuss how the characteristics of individual diseases, such as the species involved, and disease manifestations, might go on to influence the discourse, politics and practices of collaborations, and eventually result in the outcome of collaborations themselves. While I still agree with the assertion, I now feel that more than the disease itself, it is the narrative that gets framed around a disease that affects how different actors – scientists, practitioners, publics and decision-makers – respond.

Framing leptospirosis as an exotic infection leads to publications in international journals, or discussing anthrax as a potential bioweapon provides scientists with more public recognition, and funds. This provides an incentive to knowledge producers, such as scientists, or brokers, such as the media, to frame diseases as more threatening and exotic than they are in reality. While the role of media in constructing disease narratives is no less problematic (Saliba et al., 2016), my research has been focussed on examining the role of technical experts and the bureaucrats.

Zoonoses policy debates require specialist expertise, and for this reason, are often conducted away from the public gaze. This is all the more reason why the role of scientific advice and scientific institutions, in zoonoses debates in India, needs to be examined further. Despite attempts at analysing the research-policy divide (Abbas and Kakkar, 2013) and assessing institutional capacities for zoonoses research (Kakkar and Abbas, 2012) the political role of scientific institutions in zoonoses debates has not been problematised sufficiently. For example, there were two instances where the form and shape of scientific guidelines impacts decisions made in the state – both relate to chemoprophylaxis. In case of anthrax, the guidelines from NCDC did not refer to any published source of evidence, nor offer any other justification. Similarly, in the case of leptospirosis control in Gujarat. It appears that the NCDC, again, was the guiding force behind adoption of chemoprophylaxis as an intervention, even though its effectiveness ended up being questioned by local experts later. While keen to establish their technical authority, the NCDC does not seem accountable to the states for its role, for example the

refusal to test rodent samples for leptospirosis or their refusal in crediting authorship of their guidelines to the Surat experts.

Differences in perspectives and practices of veterinary and public health professions can also have a role in framing disease narratives. For instance, while the public health epidemiologists are traditionally skilled in assessing disease incidence rates and trends, as took place in Surat, the laboratory-focussed approach in veterinary public health could have prevented veterinarians in assessing disease incidence and crafting a more attention-grabbing disease narrative around brucellosis.

Another aspect of professional cultures that can directly have an impact on collaborations is that of the power dynamics between veterinary and medical professionals. The case of the anthrax response is a useful illustration of the fact that no matter how entrenched, these dynamics can be reversed with the use of knowledge. Similarly, by demonstrating their superior expertise while responding to an avian influenza scare in Tamil Nadu, the veterinarians managed to convince the public health director about the usefulness of collaborations with them. These examples, also make a case for developing collaborations based upon a complementarity of strengths between two sectors which, according to some scholars, is likely to make collaborations more robust than those built merely by adding redundancies (Ansell and Gash, 2007; Thomson and Perry, 2006).

Practices

As discussed earlier, while the politics and framings shape the overall contours for zoonoses-based collaborations, the exact nature of these collaborations are likely to be shaped by the everyday practices and constraints within which the bureaucracy of the middle operates. These middle level bureaucrats interface with the political leaderships, their administrative superiors, scientific community, engaged members of the public as well as the lower bureaucracy. These bureaucrats utilise their technical expertise and a tacit knowledge of their system to anticipate and navigate potential challenges while giving shape to the political vision of the ruling regime in a way that is acceptable to all.

Unlike the uncluttered nature of the policy statements framed at the level of the political leadership or technical agencies, these bureaucrats deal with everyday messy realities. Recognizing that it might not be possible to develop perfect solutions in a dynamic environment full of uncertainties, they are comfortable negotiating compromises and second-best solutions.

The collaborations negotiated by these bureaucrats are generally reactive, disease-based, and limited in scope. Many instances of intersectoral collaborations, especially at the

district level, are negotiated on the basis of personal networks, rather than developed through formal notifications. While unlikely to sustain over a long time, such collaborations might be more adaptive and better able to respond to exigencies of changing conditions than more formally conceived top-down implemented bureaucratic collaboration superstructures.

This is not to discount the importance of institutional models of intersectoral collaborations. Rather, it is important to highlight the informality underpinning most formal intersectoral collaborations. The converse is true as well. Many informal interactions between animal and human surveillance officer, for instance, might not take place, in the absence of a bureaucratic approval at some level. Therefore, formality and informality in collaborations co-exist and it is impossible to have one and not the other.

8.5 CONCLUSIONS

The One Health approach has set out an ambitious and idealistic, agenda for addressing zoonotic diseases. However, one major source of criticism facing the movement is that of it being divorced from local field realities and imposing a reductionist, standardized approach to intersectoral collaborations. In my review of disease based animal-human collaborations in India, I found that, while these criticisms are definitely valid, addressing them will require us to step back and take a more nuanced look at the political dynamics underlying intersectoral collaborations.

I have summarised some of the key take-away findings of my thesis for One Health and related debates below:

One Health & Intersectoral action for health

It is important to interrogate the assumption underlying most discussions on One Health and multisectorality; namely that intersectoral collaborations take the form of formal meetings and committees and are universally helpful and relevant.

Instead, if movements like One Health are to gain traction, it might be more useful to consider the local social and political realities; professional dynamics and interests; and presence of informal (and formal) networks before discussing what forms of collaborations might be useful.

One size does not fit all

Even within the limited scope of this study, I have demonstrated that intersectoral collaborations come in different forms. Before we discuss the relevance of different forms of collaboration, it is necessary that we develop a typology of collaborations in the first

place, something currently lacking in the literature. Two ways of classifying collaborations, based upon my case studies, could be by degree of informality, or by strength of collaborations.

This level of nuance about different forms of collaboration is absent within policy discourse and is also deficient in academic literature, and this needs addressing.

Politics of science, scientists and scientific institutions

More than the disease burden or risks, it is the public perception about diseases that is, in turn, informed by the narratives framed around them, which drives policy action. Given the specialist nature of zoonoses discourse, critical debates around framings of disease narratives can only take place if they are opened up to non-science, non-health voices representing alternative perspectives such as livelihoods, security and sustainability.

A necessary precondition for such critical appraisal of zoonoses discourse to take place is the recognition of politics underlying the advice given by scientists and scientific institutions. This might not be a novel insight in science studies and other streams of social science, but nonetheless, given the depoliticised nature of public health policy discourse in India, this is a gap that needs contribution from academia and the media alike.

8.6 PERSONAL REFLECTIONS AND A RESEARCH AGENDA

While not unaware about the political nature of policy processes, I started my PhD with a very limited focus on the politics of actors and power interests. Possibly because of my previous interactions with veterinarians and work on zoonoses, I also started with a realisation that the current discussions on multisectorality do not meet all stakeholders' needs, and the solutions are not likely to be found within the confines of a single discipline or topical area.

My choice to do a PhD in development studies spoke to both of the above concerns. Readings throughout my thesis work exposed me to academic literature in political science, anthropology, agronomy, public administration and science and technology studies, among other fields. Even while aware of the differences in country contexts and disciplinary languages, I was struck by the similarities I came across when reading about policy processes, collaborations, expertise and governance in fields other than public health and countries other than India.

I feel my PhD has equipped me to appreciate better the role of larger, systemic as well as local, political factors in driving the development and the performance of multisector collaborations. In addition, the last four and a half years of reading, research and reflection

have also helped me to identify other areas of inquiry that I would like to pursue based upon my research. I share some of these below.

Translation across disciplines and sectors

Lack of communication and empathy for other sectors' points of view was one finding that came up significantly in the case of brucellosis, but was also in the background in many of my other discussions in the field. While not denying the importance of larger political and structural dynamics at work, I feel that, at least in some specific situations, the lack of understanding could be driven by the fact that different disciplines have languages and meanings unique to themselves, which renders cross-disciplinary collaborations difficult to initiate and navigate.

Such differences can be illustrated in the way veterinary epidemiologists establish the presence or distribution of a pathogen using lab-based absolute numbers, whereas public health epidemiologists require population based incidence rates. This can also manifest in the way impacts of a disease are measured, such as the use of mortality and morbidity rates in public health, and economic productivity indices in the animal health sector. Approaching the intractable challenges of rabies, brucellosis or even antimicrobial resistance from the perspective of linguistic differences, rather than merely practicalities of collaboration, could offer fresh insights into tackling these challenges.

Agenda setting as an exercise in translations

As also referred to earlier in the thesis, several policy analysts visualise policy processes from agenda setting to implementation as a cycle of translations, wherein the policy vision of one set of actors gets renegotiated or reformulated based upon the exigencies involved at a different level in the process. While the role of policy elites, as well as the street level bureaucrats present in the bureaucracy is widely discussed, there is a missing black-box of policymaking that appears to have eluded academic scrutiny.

I interacted closely with the public health or veterinary specialists who were a part of policy processes, but whose roles, I feel, were not sufficiently represented in the academic literature. Roe's (2016a) depiction of policy mess managers and high reliability professionals comes closest to describing these actors. However, the importance of these 'middle-level' technocrats, who give shape to public policy goals through their technical expertise and through their negotiation with other actors, needs further examination.

Political role of public health research institutions in India

This research helped me move beyond my public health stance and adopt a more critical and political lens for understanding decision making in India. With regards to infectious

diseases and outbreaks, I have not come across political analysis of the professional and institutional politics driving the scientific advice given by national agencies in India. Even though social scientists have critiqued the social implications of different disease control strategies, I have yet to come across any focussed examination of the politics of scientific advice within infectious diseases in India, especially from an insider perspective.

Mechanics of multisectorality

As I have discussed in the literature review, multisector collaborations are not a new concept and have been discussed in the programme management literature for several decades. While some scholars of public administration (Emerson et al., 2012; Thomson et al., 2007) have developed big-picture frameworks of collaboration, I have not come across their applications or criticisms from the development sector. With increasing prominence of multisectorality and convergence in health, as well as in other sectors, through the Sustainable Development Goals, it is important to discuss the politics as well as the mechanics behind multisector collaborations.

8.7 EPILOGUE

My research has demonstrated that intersectoral collaborations are more organic, political and dynamic in nature than the program literature would have us believe. Collaborations are products of the popular framings of diseases, the politics of interests and relationships between different actors who all promote narratives suiting their agendas, and finally the practices of actors at each level of implementation, who translate these policy visions in keeping with their needs and interpretations.

Zoonoses policy discussions involve the use of specialist knowledge, and are spread across multiple sectors that sometimes have a conflicting set of incentives. Developing multisectoral collaboration in zoonoses, therefore, would also require navigation of professional hierarchies, possibly through informal relationships, and critical examination of scientific advice, possibly using a shared language.

Thus, if collaborative approaches like One Health are to take root, the emphasis should be on developing mutual trust and communication among collaborators, while allowing the contingencies of everyday politics and practices to give shape to locally appropriate collaborations, and have the focus on frameworks, institutional reforms and standardised responses recast.

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APPENDIX A: ABBREVIATIONS

CCHF	Crimean-Congo haemorrhagic fever
CDC	Centers for Disease Control and Prevention
CMC	Christian Medical College, Vellore
DAH	Department of Animal Husbandry
DDGP	Deputy Director General (Programmes)
DGHS	Director General of Health Services
DHS	Department of Health Services
DM	District Magistrate
DPH	Director of Public Health
EIDs	Emerging Infectious Diseases
FAO	Food and Agriculture Organization
FETP	Field Epidemiology Training Programme
FMD	Foot and Mouth Diseases
FUO	Fever of Unknown Origin
GMC	Government Medical College
GMP	Good Manufacturing Practice
IAS	Indian Administrative Service
ICAR	Indian Council of Agricultural Research
ICMR	Indian Council of Medical Research
IHR	International Health Regulations
IMA	Indian Medical Association
IMCAPI	International Ministerial Conferences on Avian and Pandemic Influenza
IVCZR	Institute of Vector Control and Zoonoses Research
IVPM	Institute of Veterinary Preventive Medicine
KFD	Kyasanur Forest disease
LMICs	Low & Middle Income Countries
NCDs	Non-communicable diseases
NCDC	National Centre for Disease Control
NDDB	National Dairy Development Board
NICD	National Institute of Communicable Diseases
NIE	National Institute of Epidemiology
NIH	National Institutes of Health
NIMR	National Institute of Malaria Research
NIV	National Institute of Virology
NIVEDI	National Institute of Veterinary Epidemiology & Disease Informatics
NTDs	Neglected tropical diseases
OIE	World Organization for Animal Health
PHFI	Public Health Foundation of India
PSM	Department of Preventive & Social Medicine
PVS	Performance of Veterinary Services
RBT	Rose Bengal Test
RCZI	Roadmap to Combat Zoonoses in India
RRT	Rapid Response Team
RTPCR	Real-Time Polymerase Chain Reaction
WCS	Wildlife Conservation Society
WHO	World Health Organization

APPENDIX B: LIST OF INTERVIEWEES

NATIONAL LEVEL RESPONDENTS

S. No.	Label	Designation	Organization	Sector	City
1.	A1	Deputy Commissioner (Animal Health)	Ministry of Agriculture, Government of India	Animal Health	New Delhi
2.	A10	Ex Health Secretary	Department of Health, Govt of India	Public Health	Chennai
3.	A11	ADG (Animal Health)	Indian Council of Agricultural Research	Animal Health	New Delhi
4.	A12	Ex-Head, Zoonoses Division	National Centre for Disease Control	Public Health	New Delhi
5.	A2	Director (Animal Health)	Ministry of Agriculture, Government of India	Animal Health	New Delhi
6.	A3	NPO (Microbiology)	World Health Organization (India office)	Public Health	New Delhi
7.	A4	Medical Officer	Centers for Disease Control (India office)	Public Health	New Delhi
8.	A6	Scientist 'F'	National Institute of Veterinary Epidemiology and Disease Informatics	Animal Health	Bangalore
9.	A7	Scientist 'F'	National Institute of Veterinary Epidemiology and Disease Informatics	Animal Health	Bangalore
10.	A8	Retd Director	Project Directorate of Animal Disease Monitoring and Surveillance	Animal Health	Bangalore
11.	A9	Former Health secretary	Government of Orissa	Public Health	New Delhi
12.	B4	Scientist 'F'	National Institute of Epidemiology	Public Health	Chennai

RESPONDENTS FROM GUJARAT

S.No.	Label	Designation	Organization	Sector	City
13.	E1	Director (Animal Husbandry)	Department of Animal Husbandry, Government of Gujarat	Animal Health	Gandhinagar
14.	E11	Asst Dir (Epidemic Control)	Department of Animal Husbandry, Government of Gujarat	Animal Health	Gandhinagar
15.	E14	Secy	Department of Animal Husbandry, Government of Gujarat	Animal Health	Gandhinagar

16.	E2	Dy Dir (Epidemic Control)	Department of Animal Husbandry, Government of Gujarat	Animal Health	Gandhinagar
17.	E6	Dy Dir (Epidemic Control)	Department of Animal Husbandry, Government of Gujarat	Animal Health	Gandhinagar
18.	E8	Director	Department of Animal Husbandry, Government of Gujarat	Animal Health	Gandhinagar
19.	E9	State Animal Disease Lab	Department of Animal Husbandry, Government of Gujarat	Animal Health	Gandhinagar
20.	D12	AGM Bajipura	Surat District Co-operative Milk Producers' Union	Animal Health	Surat
21.	D14	General manager	National Dairy Development Board	Animal Health	Anand
22.	D3	Vet Officer Bajipura	Surat District Co-operative Milk Producers' Union	Animal Health	Surat
23.	D4	Ex-Chairperson	National Dairy Development Board	Animal Health	Anand
24.	D5	Senior Manager	National Dairy Development Board	Animal Health	Anand
25.	D6	Vet Officer Bajipura	Surat District Co-operative Milk Producers' Union	Animal Health	Surat
26.	D7	Advisor	Gujarat Cooperative Milk Marketing Federation	Animal Health	Anand
27.	D8	ADIU Surat	Department of Animal Husbandry, Government of Gujarat	Animal Health	Surat
28.	D9	CEO	Surat District Co-operative Milk Producers' Union	Animal Health	Surat
29.	E10	Prof of Micro + State PH Lab Officer + Dy Dir (ME)	Dept of Health Services, Govt of Gujarat	Public Health	Gandhinagar
30.	E12	Medical Officer (Epidemics)	Department of Health Services, Government of Gujarat	Public Health	Gandhinagar
31.	E13	Principal Secy & Commissioner	Department of Health Services, Government of Gujarat	Public Health	Gandhinagar
32.	E3	Assoc Prof	Indian Institute of Public Health, Gandhinagar	Public Health	Gandhinagar
33.	E4	State Lab Coordinator	Department of Health Services, Government of Gujarat	Public Health	Gandhinagar
34.	E5	Addl Director (Public Health)	Department of Health Services, Government of Gujarat	Public Health	Gandhinagar
35.	E7	Asst Director (Epidemics + Urban Health)	Department of Health Services, Government of Gujarat	Public Health	Gandhinagar

36.	D1	MO PHC Vallad	Department of Health Services, Government of Gujarat	Public Health	Surat
37.	D10	Dist Epidemiologist	Department of Health Services, Government of Gujarat	Public Health	Surat
38.	D11	Regional Dy Director	Department of Health Services, Government of Gujarat	Public Health	Surat
39.	D13	ex-Prof of Medicine	Government Medical College, Surat	Public Health	Surat
40.	D15	Current faculty member	Government Medical College, Surat	Public Health	Surat
41.	D16	Ex Prof of PSM	Government Medical College, Surat	Public Health	Surat
42.	D2	IEC Officer, CHC Bardoli	Department of Health Services, Government of Gujarat	Public Health	Surat

RESPONDENTS FROM TAMIL NADU

S.No.	Label	Designation	Organization	Sector	City
43.	B1		Institute of Vector Control & Zoonoses Research	Public Health	Hosur
44.	B10		Department of Health, Government of Tamil Nadu	Public Health	Chennai
45.	B11	Director of Public Health	Department of Health, Government of Tamil Nadu	Public Health	Chennai
46.	B12	Veterinary Officer	Department of Animal Husbandry, Government of Tamil Nadu	Animal Health	Chennai
47.	B13	Asst Dir (Technical Support Unit)	Department of Health, Government of Tamil Nadu	Public Health	Chennai
48.	B14	Joint Director	Department of Animal Husbandry, Government of Tamil Nadu	Animal Health	Chennai
49.	B15	Professor	Tamil Nadu Veterinary & Agriculture Sciences University	Animal Health	Chennai
50.	B16	Jt Director (VBD)	Department of Health, Government of Tamil Nadu	Public Health	Chennai
51.	B17	Ex-Rinderpest Officer	Department of Animal Husbandry, Government of Tamil Nadu	Animal Health	Chennai

52.	B18	Secretary	Department of Animal Husbandry, Government of Tamil Nadu	Animal Health	Chennai
53.	B19	Sr Entomologist	Department of Health, Government of Tamil Nadu	Public Health	Chennai
54.	B2	Veterinary Officer	Department of Animal Husbandry, Government of Tamil Nadu	Animal Health	Chennai
55.	B3	Sr Research Officer	Central Referral Lab, Govt of Tamil Nadu	Animal Health	Chennai
56.	B5	State Epidemiologist	Department of Health, Government of Tamil Nadu	Public Health	Chennai
57.	B6	Professor	Tamil Nadu Veterinary & Agriculture Sciences University	Animal Health	Chennai
58.	B7	Ex-Director	Central Referral Lab, Govt of Tamil Nadu	Animal Health	Chennai
59.	B8	Secretary Health	Department of Health, Government of Tamil Nadu	Public Health	Chennai
60.	B9	Veterinary Officer	Institute of Vector Control & Zoonoses Research	Public Health	Hosur
61.	C1	ADIU Vellore	Department of Animal Husbandry, Government of Tamil Nadu	Animal Health	Vellore
62.	C10	Prof & HoD (Micro)	Christian Medical College, Vellore	Public Health	Vellore
63.	C11	Ex- Prof	Christian Medical College, Vellore	Public Health	Vellore
64.	C12	Field researcher	Christian Medical College, Vellore	Public Health	Vellore
65.	C13	Field researcher	Christian Medical College, Vellore	Public Health	Vellore
66.	C2	I/C ADIU	Department of Animal Husbandry, Government of Tamil Nadu	Animal Health	Vellore
67.	C3	Regional Jt Director	Department of Animal Husbandry, Government of Tamil Nadu	Animal Health	Vellore
68.	C4	DDHS Vellore	Department of Health, Government of Tamil Nadu	Public Health	Vellore
69.	C5	DDHS Vellore	Department of Health, Government of Tamil Nadu	Public Health	Vellore
70.	C6	District Epidemiologist	Department of Health, Government of Tamil Nadu	Public Health	Vellore

71.	C7	Ex Prof of Microbiology	Christian Medical College, Vellore	Public Health	Vellore
72.	C8	Specialist / Asst Dir	Department of Animal Husbandry, Government of Tamil Nadu	Animal Health	Vellore
73.	C9	Specialist / Asst Dir	Department of Animal Husbandry, Government of Tamil Nadu	Animal Health	Vellore

APPENDIX C: ETHICAL APPROVALS

UNIVERSITY OF SUSSEX

University of Sussex
Sussex Internal

Ethical Review Applications Related Links

Contents: My Ethical Review Applications

My Ethical Review Applications: Syed Shahid Abbas New Help

Application No	Project Title	Created Date	Submitted To	Submitted Date	Status
ER/SA561/1	Collaborating for zoonoses prevention and control: Cases from India	04-Aug-2014	Social Sciences & Arts C-REC	24-Oct-2014	Approved

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PUBLIC HEALTH FOUNDATION OF INDIA

Institutional Ethics Committee

Public Health Foundation of India

ISID, 4, Institutional Area, Vasant Kunj, New Delhi - 110 070

Communication of Decision of the IEC[1]
Form II

TRC-IEC No:	**TRC-IEC-250/15**	**Date:**	**April 21, 2015**		
Project Title:	Collaborating for Zoonoses Prevention and Control: Cases from India				
Principal Investigator:	Dr. Syed Abbas				
Review	**Full review**	☒	**Expedited review**	☐	
Date of review:	**09/04/2015**	**(DD/MM/YYYY)**			
Date of previous review:		***(in case of re-submitted applications)* (DD/MM/YYYY)**			
Decision of the IEC:	**Approval** ☒	**Study can begin** ☒	**Resubmission**	☐	
	Conditional Approval ☐		**Study cannot begin**	☐	
Requirements to be fulfilled in case of conditional approval:					
Suggested alterations in case of resubmission:					
In case of approval, *recommended for a period of :*	Valid for 3 years from date of study approval [2015-2018]				
Comments:	PHFI adviser is Dr. Manish Kakkar				

Please note: Beginning of the research based on this approval implies acceptance of the following conditions:

1. *PI will inform the Secretariat of the start date of the study*
2. *The PI will inform the IEC in case of any adverse events.*
3. *The PI will inform the TRC (Technical Review Committee) and IEC in case of any change of study procedure (including changes in the informed consent form, recruitment procedure, potential research participant information), site and investigator.*
4. *The PI will inform the TRC – IEC Secretariat on termination of the study and submit a final report within 3 months of completion of the study.*
5. *Members of the IEC have the right to monitor the study with prior information.*
6. *Progress report to be submitted to the TRC-IEC Secretariat every 6 months from the date of start of study.*
7. *This permission is only for the period mentioned above.*

INSTITUTIONAL ETHICS COMMITTEE

Prof. Ramanan Laxminarayan
Name and signature of Member Secretary

APPROVED
CHAIRMAN / MEMBER SECRETARY
PUBLIC HEALTH FOUNDATION OF INDIA

[1] Adapted from the ICMR form: available at http://www.icmr.nic.in/bioethics/Communication%20of%20Decision%20of%20the%20IEC.doc

APPENDIX D: CONSENT FORM & INFORMATION SHEET

PUBLIC HEALTH FOUNDATION OF INDIA

University of Sussex

Consent form for study participants

PROJECT TITLE: **Collaborating for zoonoses prevention and control: Cases from India**

Project Approval Reference: **PHFI (TRC-IEC-250/15) & University of Sussex (ER/SA561/1)**

I agree to take part in the above-mentioned research project. I have had the project explained to me and I have read and understood the Information Sheet, which I may keep for records. I understand that agreeing to take part means that I am willing to:

- Be **interviewed** by the researcher
- Allow the interview to be **audio recorded**

I understand that my participation is **voluntary**, that I can choose not to participate in part or all of the project, and that **I can withdraw at any stage** of the project without being penalised or disadvantaged in any way.

I understand that all interview **transcripts will be anonymized** and **references to my name will be removed.** I also understand that **complete confidentiality cannot be guaranteed** for information which I might disclose in the interviews.

I am happy to have my name listed as one of the respondents interviewed for this study. YES ☐ NO ☐

I am happy to have my name listed along with quotations arising from this interview. YES ☐ NO ☐

Any other concerns? _____

I consent to the processing of my personal information for the purposes of this research study. I understand that such information will be treated as strictly confidential and handled in accordance with the **UK Data Protection Act 1998.**

I agree that the information provided by me can be used in **further research** projects which have research governance approval as long as my name and contact information is removed before it is passed on.

Name: _____

Preferred Designation: _____

Signature & Date: _____

PUBLIC HEALTH FOUNDATION OF INDIA

University of Sussex

Participant Information Sheet: Collaborating for zoonoses prevention and control: Cases from India

You are being invited to take part in a research study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully.

What is the purpose of the study?

While zoonoses are an important problem in India, there is limited understanding about how to best respond to them. This is a 3-year long PhD study that aims to identify the conditions under which intersectoral collaborations for prevention and control of zoonoses in India occur.

Why have I been invited to participate?

The study will involve interactions with programme officers, bureaucrats, frontline workers as well as other engaged actors across the different sectors involved in zoonoses-related coordination in Gujarat, Tamil Nadu and the national level.

You have been invited to take part in the study because of your unique insights into the practical issues related to the research topic. Your opinions and perspectives will be very important in helping us develop an informed and balanced understanding of zoonoses policy response in your area.

Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep. Even if you decide to take part you are still free to withdraw at any time and without giving a reason.

What are the potential risks/benefits to me?

We do not envisage any risks to you for sharing your views. However, in case you would like to restrict the information you want to share, such as your name and designation, please feel free to communicate the same.

Will my information in this study be kept confidential?

All notes and records of this interview will be anonymized. The transcripts will not refer to your name and will be stored in secure location. All efforts will be made to anonymize the quotations to the extent possible and if you want, all verbatim quotations from your interview will be checked with you for accuracy and risks before including in the study publications.

What will happen to the results of the research study?

The findings from this research study will be documented in a PhD thesis and subsequent publications. Electronic copies of all publications arising from this study will be shared with you as and when they are published.

Who is organising and funding the research?

There is no specific funding for this study which is being carried out as a PhD research project at the Public Health Foundation of India and at the University of Sussex in the UK.

Who has approved this study?

The research has been approved by the ethical review processes at the Public Health Foundation of India and at the School of Global Studies, University of Sussex.

Contact for Further Information

In case of any further information, feel free to contact Dr Syed Abbas at syed.abbas@phfi.org / s.abbas@ds.ac.uk (Mobile: +91 98717 18317 / +44 744 802 5633).

If you have any concerns about the way in which the study has been conducted, you can contact the Ethics Review Committees at Public Health Foundation of India and University of Sussex, respectively at the following address:

Prof. Ramanan Laxminarayan (Member-Secretary of PHFI-IEC)
Contact information: Public Health Foundation of India, ISID Campus, 4 Institutional Area, Vasant Kunj, New Delhi 110 070; Tel (Office): +91 11 49566000
Or, Dr Manish Kakkar at manish.kakkar@phfi.org

Ethical Review Committee, University of Sussex, through Dr Hayley MacGregor at H.MacGregor@ids.ac.uk

Thank you for your time and consideration.
4 December 2014